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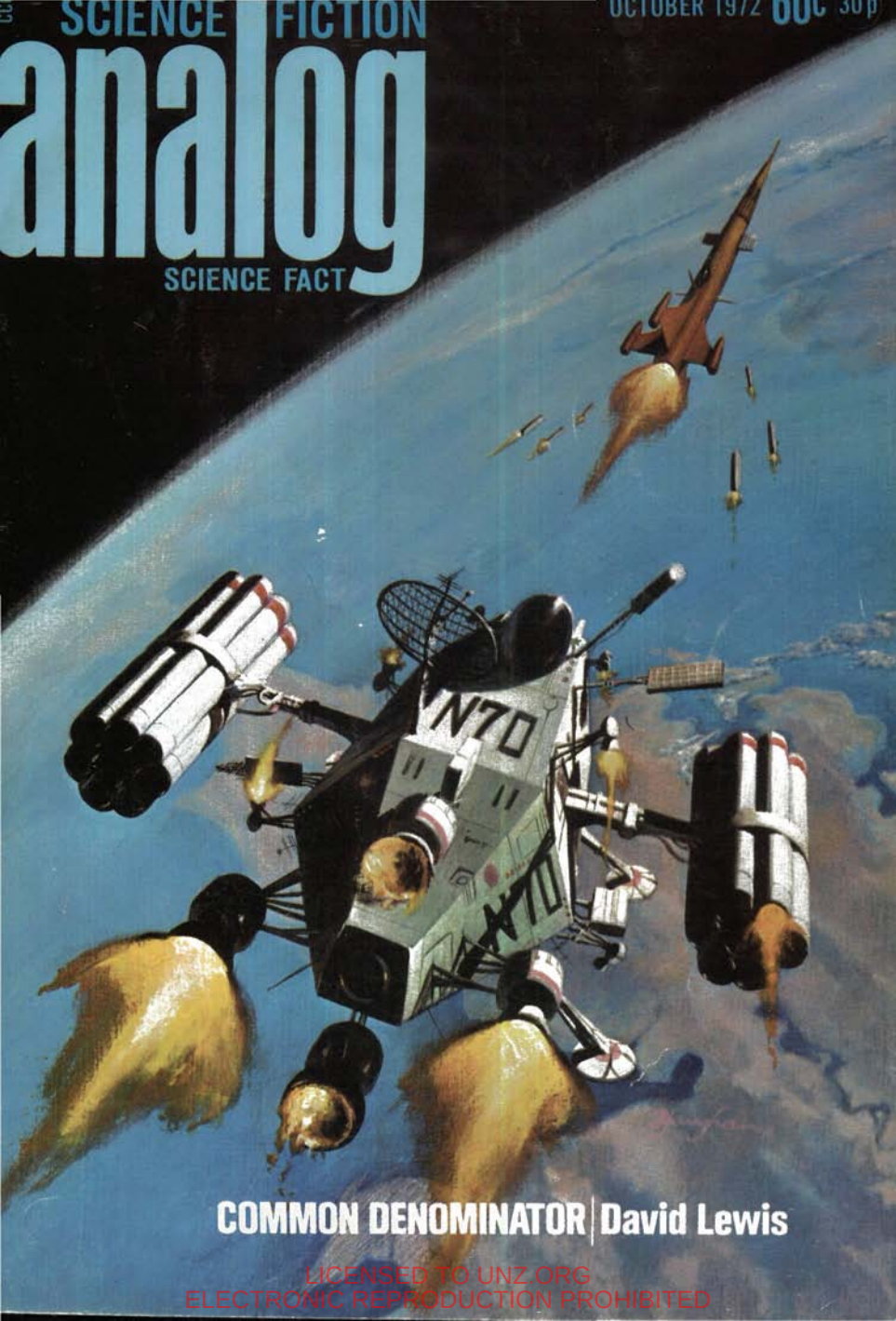

COMMON DENOMINATOR | David Lewis

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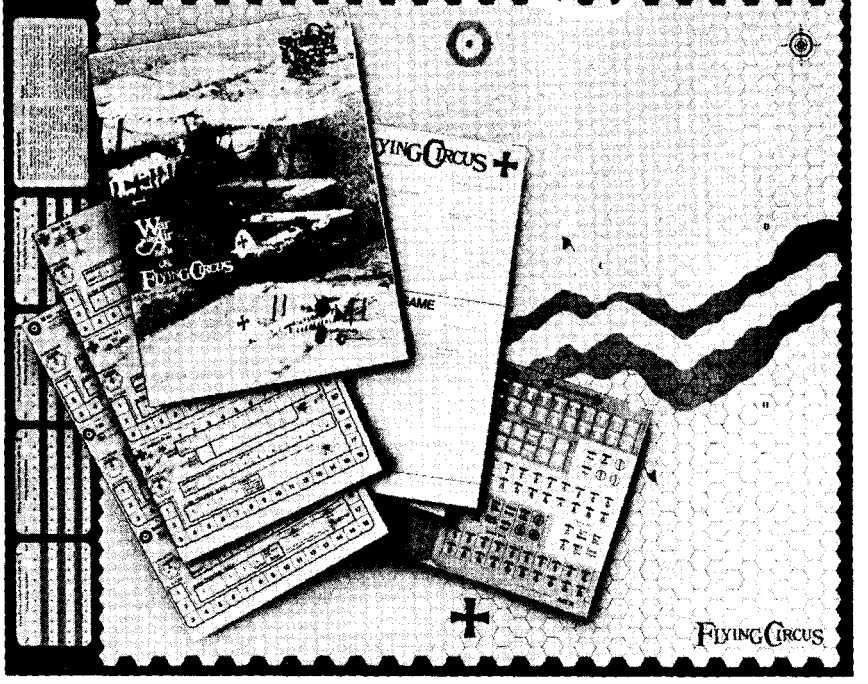

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Editorial

The Revolutionaries

Harvard Square is one of the great crossroads of the Western World, an incongruous conglomeration of buildings old and new, construction workers and students, learned professors and unwashed hippies, milling through an impossible traffic crunch of autos, buses, trackless trolleys and bikes.

Not long ago, somebody pushed a pamphlet into my hand as I was walking through the Square, and intoned, "All power to the people."

Without even thinking about it, I muttered back, "Nobody can be trusted with *all* the power."

He was staggered. We went into an interesting, but not always rational, discussion of American political traditions, there on the street corner in front of the Cambridge Trust Company's main office. We attracted something of a crowd—mostly young, about equal numbers of black and white. They made it clear that most of them considered themselves to be revolutionaries, of one sort or another.

It also became clear that none of them had a firm understanding of what a revolution is.

The American Revolution wasn't in 1776, with the Declaration of Independence. It didn't really begin until after the fighting had stopped. The *real* Revolution happened in 1789, with the framing of the Constitution.

A revolution is not merely the overthrow of the existing establishment. That may be a necessary ingredient, but it's not sufficient to create a revolution. A revolution is the creation of a new order, a new establishment. There have been plenty of *coups d'etat* and bloody insurrections throughout history, but precious few true revolutions. The nations of Latin America seem to go through a new uprising with every phase of the moon, yet there have been few revolutions there: only the exchange of one dictator for another.

Political revolutions are very rare. And we might make the case that they happen only after revolutions of thought have paved the way for revolutionary changes in government.

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The French Enlightenment fathered the American Revolution, for example. And behind the thinking of Rousseau, Voltaire and the other philosophers of the Enlightenment, was an even deeper revolution that ultimately changed the entire world: the sweeping new concepts of the universe and man's place in it, as formulated by Copernicus, Galileo, Newton and the other scientists of the Sixteenth through Eighteenth Centuries.

Science and its offspring, technology, are not the only revolutionary forces in our world. But they are an important—perhaps decisive—factor in changing our attitudes, our social customs, our economics, and our politics.

The former director of the National Bureau of Standards, Lewis M. Branscomb, put it nicely:

"Technology has brought us changes, most of which we should welcome, rather than reject. Wealth is the least important of these changes. Of greater importance is change itself. Those young humanists who think themselves revolutionaries are nothing compared to technology."

Ancient Athens was a proud democracy—for a small number of its citizens, the free-born males. When asked how he could be so proud of his city when more than half its population were slaves, an Athenian replied, "When the looms spin by themselves, we'll have no need for slaves."

It took more than two thousand years, but science and technology finally eliminated slavery. Not the politicians, not the religious leaders, not the philosophers and abolitionists. Technology did it. When steam power became cheaper than human muscle power, slavery collapsed.

When the Industrial Revolution came on the scene, in the early Nineteenth Century, the most horrified people were the former slaves themselves. While a new and growing class of capitalists was busily amassing fortunes (and often losing them with equal speed), the former slaves and workers resisted the technology that was turning their safe, old, well-known world into something new and scary. These workers were being wrenched out of their centuries-old traditions and being thrown off the farms and out of the villages, to starve or—maybe worse—move into the ugly, dirty, dangerous cities and go to work in the factories.

Some workers rebelled. They smashed the newfangled machines and insisted on keeping the old ways. By 1815 the movement had acquired a name: Luddite. Ned Lud has the distinction of being the first man in recorded history to attack a machine. Historians generally add that he was a half-wit. As a counterrevolutionary force, the Luddites had about as much chance to reverse the Industrial Revolution as the Scarlet Pimpernel had of stopping the French Revolution. And the "good old days" that the Luddites wanted to re-

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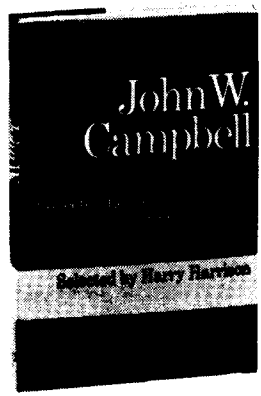

turn to consisted of dawn-to-dusk back-breaking labor, for pennies!

But those early factories were even worse, as anyone who's read Dickens can understand. As the new industrialism flowered sootily in Europe and America, men such as Karl Marx decided that it would take bloody revolution to achieve changes such as a ten-hour workday and retirement benefits. Marx and the other reformers failed to understand the real revolutionary force of technology, which eventually produced enough wealth so that today's workers have more luxuries than most of the world's emperors have ever known. Of course, it took action and pressure by the workers to get their share of the wealth. But if the wealth wasn't there in the first place, nobody would get to share it. Technology produced the wealth.

Technology helped the workers to be more productive, which created more real wealth, and eventually eased the workers' lives. Today, it's clear that the life style of a nation's workers depends on its technology, not its ideology. Technology-poor communist nations are no more a workers' paradise than technology-poor capitalist nations. And vice versa.

Today a Second Industrial Revolution is in full swing. Thanks to

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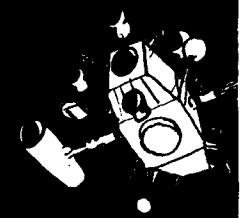

DAVID LEWIS

Common Denominator

Battle is at once terrifying and exhilarating—
a time of killing fever and death fear.
The fight against the enemy out there
is only half of the story, though; there's also
the fight against the enemy within!

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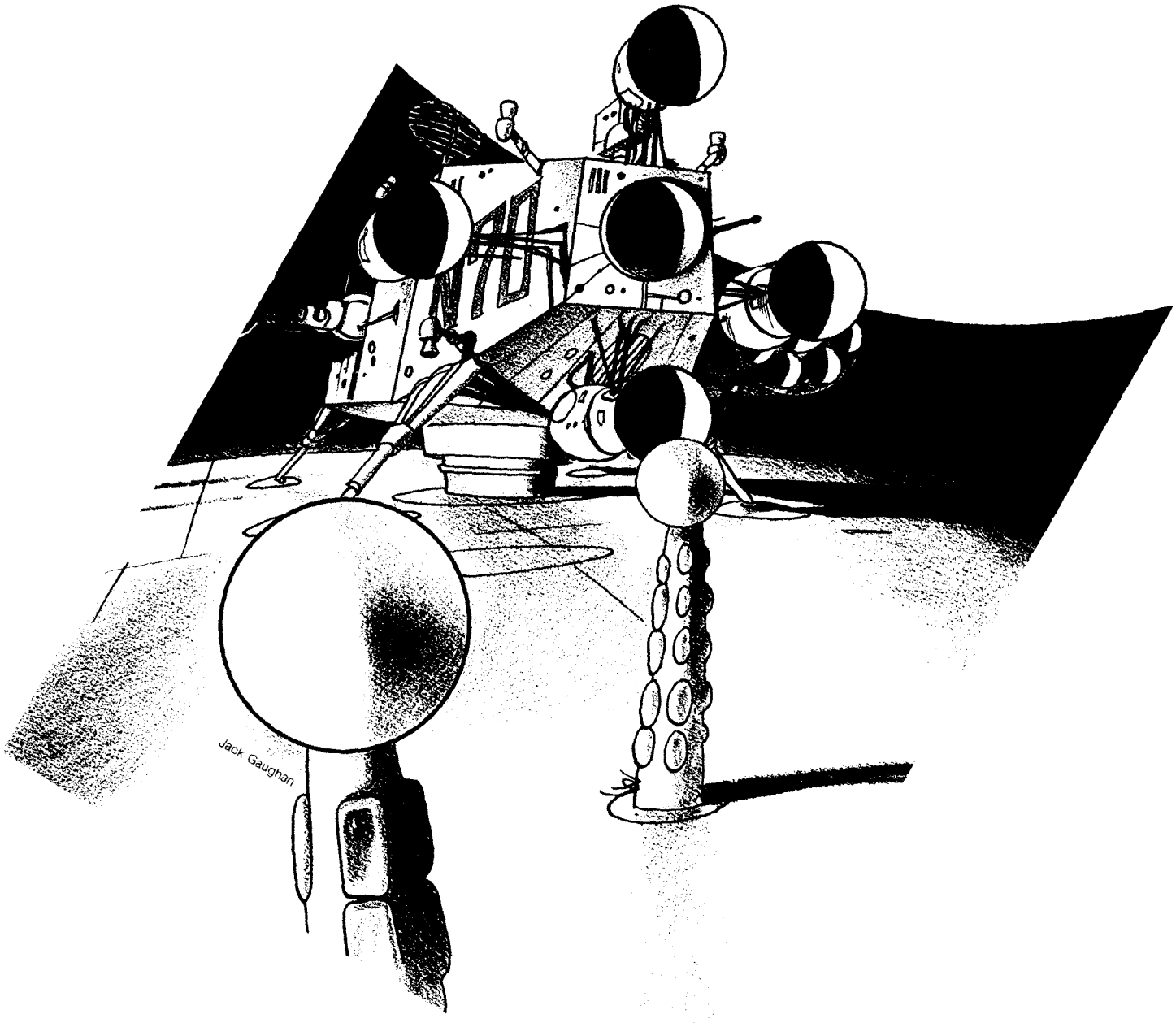

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Lot—a plain enough word to roll from your tongue, but like most words it's only a symbol and stands for something more. In this case that something is a world, a single, fragile sphere of life in orbit around an unprepossessing star, though that still misses the point. What Lot stood for then was a colony, planted by the other side, and this the staff officers noted with a clucking of tongues, and on this they consulted long and hard, and in response to this the avenging angels of our high command coldly decreed invasion. Thus the plans were made that would ravage the world, and the forces were gathered to seize what was left. And over a million men were committed, while the forecast that summer was blood.

All of which, of course, I had seen before.

But of all these things the last is the most important, for this is not Lot's story, but mine, and after Lot I could never again say "of course" to a season of slow-running red. That much I owe to Richards, a man to whom I wished never to owe a thing, and a man for whom my saying this would be cause enough for renewing our vendetta. He may try it if he likes. For me that feud was undone in the final, climactic moments of the end, and never again will it stir or raise its hideous head. I am above it now.

To seize a planet is an awesome task; logic can tell you as much. The area to capture, the numbers required, the logistics to support those numbers, all are astronomical. Lot held a slight advantage there, for nine-tenths of her surface is swimming with ocean; to credit her with a million people would be absurd. The semiofficial figure was twenty-four thousand, plus the soldiers, ground crews, cooks, and supply sergeants that give a place its strategic importance. Against this the Federation had spaced its inconceivable sea of soldiers and the hundreds of ships it would take to carry them. Of all this I was aware, for I was part of that general build-up, and yet, somehow, I didn't know it, merely sensed it and let it rest at that. I was a one-man fighter pilot—which took up more than enough of my time—and had no real desire to know the magnitude and the cataclysmic effect of the tide with which I ran.

And so, while the August sun boiled hot over the northern hemisphere of Earth, we massed our forces on and around Garr VII, sapping our strength from Lord knows how many navies. Space overflowed with the greatest shipping concentration in the skies as Garr grew rich on the lust-based institutions of war, preying on hordes of uniformed men. I arrived late in the process, received my posting to Twenty-third Squadron, and boarded battle cruiser *Polar Star* to join the rest of my unit.

None of us knew our eventual destination; the command levels had

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pleaded security and declared it a secret. We met in bull sessions and wrangled the problem out with pure supposition, but still, after six years in the service, you begin to pick out patterns, and sometimes those patterns seem to push guessing close to fact.

"Gonna be bombardment!" declared Richards, lounging in the recreation complex with glass in hand. "Old Twenty-third'll ride in and whip the hell outta some Tar world. Only stands to reason," he added loudly, before dissenting voices overwhelmed him.

"Right on, Richards," someone scoffed. "What about the transports, then?"

He had a point, this nameless one. I stopped listening with one ear and paid full attention, curious to see how my wingman handled the challenge.

"Hell," he observed soggily, "didn't say only bombardment, did I? Hell, no. Just said old Twenty-third'd be bombarding. Transports, soldier boys, they can tag along if they like, but it only stands to reason. We gonna bombard, we gonna soften up, and then them soldier boys, they's gonna invade!"

Someone laughed softly while the dissenter withdrew, stung but trying to hide it. I decided to bridge the gap.

"O.K., Richards. Before you're under the table, tell us how you know. That's what he's asking."

Richards pouted at me, soddenly sour-faced.

"Old Mr. Cavalry," he muttered, "over the hill in the nick of time."

He drained the glass, swayed a little, and grinned, relishing the attention.

"Only stands to reason," he proclaimed again. "They strip half the shuttles off this ship, don't they? Fine. Maybe they're giving it landing boats, so it can carry troops too, maybe? But they don't give landing boats; 'stead they bring *us* in, and stick *us* where the shuttles were. And what're we, I ask you, but the best damned anti-interceptor unit in the fleet? Nobody flies fighters like we do! But why'd they want great anti-interceptors 'cept we're going near a Tar world where the interceptors'll buzz like flies? And why we ever go near a Tar world, 'cept to have the good old Twenty-third whip the hell outta the Tars on it!"

He settled back, smirking into his empty glass, while the rest of us laughed a little, except for the dissenter who was well and truly put down, and me. I don't laugh at suppositions I agree with, and Richards had one now.

There was no reason for gathering forces such as we had except to launch an invasion, and from helping in the capture of Hifendel II I had come to know the signs. The modern battle cruisers of Twenty-third Squadron were the only ships in the fleet that could consistently slug it out with planet-based bat-

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teries and win. It was a situation not unlike the ship-of-the-line-versus-fortress problems, back in the 1800's on Earth. It was a rare square-rigger that could make solid masonry fly a white flag, but as long as that flag refused to wave the transports could not get through. No, there were few flaws in Richards' simple logic; the only questions remaining were when and where.

So we hung in the Garr system, getting impatient, getting bored, getting clues as to what was going on. My wingman still pushed the bombardment theory, but with modifications. He probably hadn't considered the troops before the scoffer brought them up, but once they appeared it was the forecast that had to change. His hopes of shattering a Satarii home-system planet faded, and instead he searched the battle cruiser's tape-banks for worlds small enough to be captured. He surfaced again with Sandarnia, where the Tars had been crushed in a fleet action; Greater Stinna, main planet of a binary system; and Lot. I mentioned patterns. Both Lot and Hifendel II were nearly all-water worlds, and Richards had been with me at the latter. He drew an analogy and labeled Lot as our goal. I'll never know how the security officers reacted when the rumor started spreading, but they must have gone quietly. To hold the pilot as a Satarii informer would have admitted that he was right.

Their quandary would have pleased Richards, for he was that kind of person. I half loathed him, but at the same time he and I had operated together longer than any comparable team in the fleet. He was my wingman, and if I was the best one-man fighter pilot in the fleet—and I was—then he was the second best. As a unit in space we were virtually indestructible, and we occasionally proved that way planetside, too. Shipside, without the glue of shared danger, we were like a double novel, the kind where you get two books under one cover, so that when you've finished with one story you find yourself up against the upside-down, last page of the second. Opposites. And usually one of the novels is bigger and better than the other one. Try working that into the metaphor.

"Friend," he would laugh as we stretched on our bunks, "friend, you are just too saintly for words. Why the hell should I stop knocking the Army? They hate our guts so I hate theirs. Fair enough? Fair enough. You're a hypocrite, Smithy. If you're gonna be so damned forgiving you gotta go all the way. Forgive the Tars, why don't you? Hell, they're only doing what they think's right, for them."

"You've got your premise wrong," I retorted. "I'm not forgiving; I just haven't condemned. Like the Tars. Why should I condemn them, Richards? Because they're doing what's right for them? That's all our side's

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up to. Why should I hate the Satarii, or is it just your say so?"

His light flickered on, breaking regulations, and then his fingers were tight on my arm, yanking me over to stare at his face.

"Friend," he spat, "the Tars are going to hell, and I won't have none, not *none* of your peace-pipe talk!"

He shook me; I let him, then jerked my arm forward, flinging him off balance and breaking his grip. We glared at each other across the gap between our bunks.

"I've two dead brothers say 'No!' to your talk, Smithy! And I won't hear any more of it!"

Then his light went out, leaving me alone with the dark and the ugly look set deep in his eyes.

Maybe we needed each other for that glare, a focal point closer than the Satarii could ever be, save in the heat of battle. Maybe that was why we'd stuck together so long. Me, to have something close at hand to master; he, to try to smash my composure and drop me to his plane. "Hate and be hated!" he'd say. "Get off the fence, you hypocrite! Get outta your tower, Smithy, so I don't have to *tear* you out! Sooner or later, friend, I say I will."

II

Garr VII had become, with the coming of the fleet, a filthy place, aswarm with those jerry-built institutions that thrive on men and plunder self-respect. It had also become a dangerous place, crawling with soldiers, sailors, and antagonisms. The handful of law-enforcement teams were totally inadequate for controlling such a jungle, and I hesitated to go planetside. Yet, when Richards declared his intention to do so, I had no choice. Someone had to look out for him.

Headquarters had stripped *Polar Star,* the battle cruiser to which we were assigned, of half her lifeboats and half her shuttle craft. In the berths where these craft were usually stored, the powers-that-be had inserted our one-man fighters, wicked, fifty-foot tangles of engines, avionics, and missiles. That meant that the normal load of eight ferries was being handled by four. We were crushed on board for the ship-to-shore ride, sweating it out with heads in our faces and elbows through our sides. We stumbled out at the port, half-nauseated, able only to walk into town. The buses were no less crowded and smelled infernally.

Garr VII is a strange world, with little ocean, few plains, no mountains. Save for salt-marshes near the sea, it is all woodland, a tight, dense woodland, an afghan of dripping, black-leaved forest. What cultivated land there is has been hacked from the jungle, and it is only through constant skirmishes with encroaching vegetation that any is maintained at all. Likewise the roads. The one we followed was a virtual canyon, a narrow white strip between walls of darkness that swayed and groaned

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with the breeze. Richards and I tramped along it for over a mile while dark-bellied clouds drizzled rain against our heads and olive-drab buses, filled with Army rowdies, careened around corners like madmen. By the time we reached the settlement we were in desperate need of stimulus, and the first order of business was to seek it out.

Beyond the boarded-up storefronts of those who had always lived here were the ramshackle, transient structures of the carrion crows, riding the wings of storm for easy profit. Crude or not, they offered us heat, food, and drink, and I was not so fastidious as to complain.

But I did note with sudden suspicion that the bar Richards steered for was thronged with Army-gray.

"Richards," I said, "that place's not for us."

"Sure it is," he grinned. "Army's not gonna stop us, are they? The two best pilots in the fleet? Hell no!"

"Friend," I said, sensing a trap, "that we may be, but we're not the two best in-fighters. I didn't come down to brawl."

He stopped then.

"Course not," he sneered. "You came to keep an eye on Richards! Well, Smithy, to hell with you! I'm thirsty, and that's the closest place around."

He strolled on—or swaggered, rather—toward the galvanized-steel front. Some of the Army men watched him, grinned, and unfolded their clump out into a wall, arms locked, blocking the door. One or two thoughtful ones lifted bottles.

"Richards, you damned fool!" I shouted, and the battle joined.

Richards was tough, but at times the Army proved tougher. It took five minutes and one gray-clad tough recovering in the street, but eventually my wingman stumbled back, cursing but undeniably beaten. The Army crowd swore cheerfully back, and someone lobbed a bottle. It shattered against the wire-mat roadway, scattering shards of glass. I escorted my battered companion to a less conspicuously Army bar, situated him at a table, and got us both drinks. We sipped them silently.

"Smithy," he said after a long while, "if you'd of come in, we'd of left those goons all over the drive."

One of his eyes was swelling shut, but other than that he seemed unscathed. The service kept his hair so short that it couldn't get tangled, and he had straightened his uniform before coming in. I glanced at him and nodded in response to his statement, but that was all.

"Smithy," he demanded, "why in hell *didn't* you come in?"

That definitely called for an answer. I leaned back and took another drink, letting it clear my mouth before I spoke.

"You pulled a dirty trick, friend," I told him. "I don't care how you feel about the Army. I don't care how the Army feels about me. Your venom is your affair, Richards, not mine. You

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tried to get me into a street fight. That's real nice. Don't try it again!"

He returned my glare with a half-formed smile, uncertain how to take my response, emptied his glass and stood up.

"So much for wine," he said, deciding to ignore my anger. "I'm off for the rest. And Smithy, no need to follow, eh? Old Richards can handle himself, you hear?"

"I hear," I returned curtly, and he left. I watched him go, swaying out the door and heading for the farthest fringes of the carrion-crow zone, then I also got up and followed him out.

Night, already looming near when our shuttle had grounded, had now closed in with impressive finality. Some twenty yards away a hanging arc lamp gave light to the roadway, shining off puddles where the wire matting had sunk into potholes and mud. Everything seemed slimy with rain; it tasted of fungus, humid and choking. A singularly filthy night.

Having nothing to do, and being reasonably sure that my wingman would take it easy for a while, I decided to explore the settlement. It had appeared safely antiseptic when we passed through, but that was not necessarily a fault. Besides which I had an abiding curiosity about these far-flung outposts of our species. I had seen maybe twelve of them, each unique in small, surprising ways. Perhaps Garr VII would prove the same.

I quickly found that the established town was boarded up. The people seemed to know what the fighting eagles, the clean-cut heroes of the news and adventure films, were really like, and they had taken precautions accordingly. The screens and barriers weren't ramshackle, either. The fleet may have been prepared to leave the next day or stay for eternity; it made no difference to the natives. The heritage left them from colonization, from not having time to waste repairing sloppy work, needing protection against a vicious unknown, had left its mark. Well, they knew what they were up against this time, but it hadn't changed their traditions. There were no cracks large enough to let light through, and it was only when I was despairing of finding anything that I stumbled upon an open building.

It was a store, the one farthest from the port and temporary slums as possible. Perhaps the locals had held a council meeting in the secrecy of their town hall and had decided that this store, because of its distance from the corruption and because its services were so essential, this store would have to be kept open and operating despite the two-legged locusts that had descended like clouds from the sky. Or perhaps the owner was a gambler, willing to run high risks for his own small share of war profit. But regardless, it was open, and I went in.

A number of local inhabitants, distinctly so in their workman-like

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garments, were present. They glanced in my direction and drifted to the far end of the counter, presenting their backs in a uniform front. The hint was taken and I avoided them. That left two people, the storekeeper and a customer, who were dickering over a basket of fruit, long, curved and yellow. I drifted closer, to be able to catch them once the deal was completed.

When it was, it was plainly in the storekeeper's favor, for he stepped back grinning, then caught sight of my uniform and scuttled for shelter at the end of the counter. The other man didn't move, though. He simply stood over the basket of fruit, and swore softly to himself. I moved up beside him and leaned against a stack of feed sacks, while looking with excessive interest at the fruit.

"What are they?" I asked. "They seem familiar, but I can't place them."

It was the first time he realized I was there, and before my military status registered it was too late for withdrawal. I could see that realization slowly fill his eyes. They were interesting eyes, darkish brown but not deep. There seemed to be a shield behind them, to hide whatever gears were working deeper in his mind.

"Bananas," he said curtly.

I puzzled over that for a moment, feeling the sense of familiarity more strongly than before, but still unable to grasp what stood behind it.

"Grow them here?" I asked him.

"Yeah."

He hesitated, then reluctantly added more.

"Not native, though, not hardly. Come from Terra."

The key snapped into place.

"Hey," I laughed, "thought I'd seen them. My brother Benjamin once, a long time ago, brought some back from a trip he made. Thought I knew them! Haven't seen Benj for five, six years, and it's been a good ten since I tasted bananas."

Throughout all this his face registered only suspicion, and now his voice held the same.

"Trying to set me up?"

The gulf between military and civilian opened at my feet. I looked way down it, trying to see the bottom, then raised my eyes and looked across at the farmer, for so he seemed to be. I wondered briefly if I should shout to make him hear me, but volume rarely puts one's point across. He waited for my response, belligerently defensive.

"No," I said. "Trying to break you down. I've spent an hour down here looking for someone alive who won't hide under a counter, and I didn't do it for bananas. If I wanted to set someone up there are enough drunks in the bars down here to make a fortune."

He still didn't loosen.

"And you're not a drunk, maybe? And maybe you're something worse."

"Maybe. But I'd argue the point.

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It's possible, isn't it, that some servicemen are human too? And your storekeeper here looks pretty civil, but your face looks like he cheated you bad as anyone. How much did he charge for that fruit, eh? Tell me and I'll buy one from you. Parasiting's not my way."

He held fast for a moment longer, but something I had said had hit home, and gradually a smile formed on his face, weak but plainly there.

"O.K.," he said. "Sorry, but I'm suspicious; you would be too." Which seemed to break the ice firmly and finally, since I still was suspicious, even after seven long years in the service. It's instinctive. Like Pavlov's dog, your mind learns to link danger to environment, scaldings to boiling water, death to war, and parasites to the military and the dusky world it moves through. Sure, he was suspicious, but I was suspicious too, and that link-up gave common ground and yet another reaction which is still best described as friendship. We had broken the barriers, and the vistas that opened were worth what pain and trouble it took. For an hour we talked of the microcosm of Garr and the greater cosmos that lay beyond, and when we parted to go our separate ways again, the wall between us might never have been.

The sky was starless as I set out to rendezvous as best I could with Richards; heavy clouds, straining at their seams, sped west on a soaking breeze. The temperature had been dropping steadily, and the humid claws of night tore against my clothing, cunningly poked its talons through every chink. Though there was no mist or rain the visibility was poor; light simply failed to penetrate the gloom, and beyond their limited spheres the streets were even darker than before. I pushed myself harder, breaking into a dogtrot as I struck out for the farthest edges of the parasite quarters.

I could find no sign of Richards. Turning back into the face of the wind, I strode briskly back toward the bar we had stopped at earlier, assuming my wingman would return there before too long. There were two shuttles back to *Polar Star.* I would have opted for the early one, but unless he showed up sooner than I expected we would have to take the last boat back to the battle cruiser. It was going to be a later night than I would have liked.

I was making my way down the alley that ran alongside the establishment when I heard a half-intoxicated clamor break out ahead and a little farther down the main street.

"'Lo, starchy!" someone was shouting. "Big civvy bastard runnin' from the Army?"

My attention perked higher, but no identifying answer came back. Nonetheless, I moved faster.

"Oooh, big man! Your chest as fuzzy as yer head, civvy?"

The taunts were coming from just

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beyond the mouth of the alley, from the direction of the Army bar Richards had tried to crash. The voices sounded familiar, but that meant nothing; all thugs sound alike: a mark of the species. I came out of the alley entrance and looked sharply around.

A cluster of men, soldiers from the cut of their uniforms, were leaning off the shaky porch of a building twenty feet away. I edged toward them, keeping myself hidden in the shadows. A string of arc lamps lighted the street like a stage.

"Gawd, lookit the stride he got! Big little bastard, ain't he!"

Silhouetted by the street lights, the thugs cut an intriguing picture. Several slumped against each other, drunk and dead to the world. Three or four others were near that point, but then maybe five were tensely alert, savage and eager for trouble.

And then I saw the civvy, and he was my farmer from the store.

I tell you, I was proud of that man. Civilian, untrained, unversed in the cold realities of military hatred, threatened by drunks and worse, he hadn't broken. Instead he was walking with deliberate slowness, ignoring them for what little they were worth. My mind went out to him, sensed his stomach knotted tight but that misplaced sense of pride saying over and over, "Keep those legs moving slow, boy, don't you panic none cause that's exactly what they want you to do and you're head and shoulders above these scum, boy, cause you're a man and scum is all they are." And all the while his feet moving slow and steady and his stomach tied up like Alexander's Gordian knot.

And one of the Army men, grinning like a circus ape, reached down beside him, hefted a bottle, and sent it flying.

Clean and smooth, the cold glass lump and the cool, lanky civilian converged, directly beneath a hanging arc lamp, and the cold glass lump smashed full against his head. He stopped in his tracks, straightened, and then, like a landslide almost, collapsed upon himself and sprawled face down in the wind-licked mud. "Chrissake!" someone shouted and I hit them.

Two steps to get there, one to lay the ape-face against the wall, another to smash him onto the porch, and then hell came swirling in from all corners. Whirling, smashing, bloodied faces, grating hate and alcohol and the battle cry of Richards swinging in and playing wingman while we nearly toppled that porch to the ground and emptied its contents out into the street before two M.P.'s ran panting up to slap us into chains.

Richards grinned, his other eye closing like an egg. "Just stay in your God-damned tower, Smithy? Hell, was that God-danged good!" and the wagon arrived. I made it onto the early shuttle, but the farmer only made it to sick bay.

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III

"For God's sake, you two! Do I have to confine you to quarters?"

Captain Stephens was perturbed. Small, dark, but strong by any definition of the word, he was not one to cross, and obviously we had.

"I knew! I heard it. Richards going planetside. God Almighty, I thought!"

He was pacing while we stood rigidly upright, hands still manacled, so rigid a ramrod could slide down our backs. The cabin was small, and in it Stephens was a tiger caged.

"Richards!" He wheeled on us. "You damned fool! Another brawl and you're discharged! Regulations. I can't help it. No ruptured duck either, man! Out on your face! For God's sake, Richards, you're half the best fighter team in the fleet! Speak! Justify, before I take *my* fist to you!"

My wingman pouted sourly. The lines at the fringe institutions had been too long, and he had settled for a quart more beer, which left him none too steady. Besides, M.P.'s don't like drunks, and they aren't afraid to show it. Richards carried bruises that weren't from Army fists.

"No excuse," he muttered.

"Just damnable interservice antagonisms," growled Stephens. He glared at me. "And you too, of all people! The one man I thought I could trust. Get out, both of you!"

We started for the door, but he stopped us with a wave of his hand.

"Get the guards to unchain you. I trust you're still able to function, still able to see? Richards?" My companion turned sullenly. "Get a doctor to fix your eyes. Of all the times to get smashed. Go on, now!"

We left the room to run up against the M.P.'s who had brought us in. Grinning, the younger one snapped a key into our manacles and removed them. He left, followed by Richards, followed by the other M.P. I started also, but stopped short and returned cautiously to the captain's door. I rapped softly.

"Who?" he snapped.

"Smith," I answered.

He snorted; the room made no pretensions to soundproofing.

"Enter, blast you."

I did.

"O.K., Smith," he sighed, leaning back in his desk chair, "what is it? I won't apologize for my nerves; that's what you met, not temper. But for God's sake, you two! What is it, Smith?"

"The Garr farmer," I said. "The one who caught the bottle."

Stephens' frown took a different turn.

"Concussion and minor fracture. I've been told, of course. I'm responsible, damn it. Remember that next time, why don't you?" He looked up. "So that's it. I wondered, Smith, what it took to fire you. Prejudice, I thought? No, not him. Drunk? Maybe, but still. An affair like this? I heard it all; M.P. saw the guy get it, just didn't react in time. Fine. This

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sort of thing's your trigger? Let's disconnect this one too, eh? Don't go!"

I stopped halfway to the door and noted with surprise his intensely worried face.

"Listen," he said, "you two are really all right? Nothing a rest won't fix?"

I nodded.

"Good. Then for God's sake, rest! And sometime, like later today, check over your ships. You picked a devil of a time! We're moving out tomorrow."

"What?" I started. Stephens' frown stretched deeper.

"Twenty-third Squadron, plus Lord knows what else, jumps tomorrow. Bombardment of Lot—you know the planet—then the troops follow. We need you both to fly anti-interceptor screen. So check out your fighters. I understand you won down there. That's great. Let's make sure you do off Lot. I don't want mechanical failures to kill you. For God's sake, Smith. You, alone, are the best fighter team we have. Richards is just lucky enough to be wingman. Not that he's bad; he just lets himself get out of hand. But damn it, Smith, we need you! Let's not pull this stunt again."

"I won't," I said. "Thanks. I'll check the ship."

Then I left for my quarters. With a fleet jump coming the next day, I would need all the rest I could get.

From Bunk Complex C it is a matter of a few quick steps to reach the aft flight zone, and that evening I made the journey with Richards in tow, to check out our dormant fighters. Like Captain Stephens, I didn't want death through mechanical breakdown. If the Tars couldn't kill me, nothing would.

My ship proved to be in excellent shape. The interior check revealed no problems within, and then, while the suit's life-support system muttered in my ears, I made a minute external inspection. The hull was intact, unpitted, gleaming as though freshly varnished. I patted the green dragon, hand painted, that crouched below the cockpit glass, and made my way back to the air lock. *Night Killer II. Night Killer I* had been crippled off Hifendel by a salvo that came too close, but I had equal faith in the second. She had already racked up an impressive score, destroying five space-black Satarii fighters. As far as I knew, that was the highest score in the fleet for a single interceptor, discounting only her direct predecessor. *Night Killer* was unique in other ways, too. She was the only interceptor in the fleet to sport a name as well as a code number, and she was the only one to be painted.

That's not strictly true; what I'm referring to is the dragon. Actually all our fighters are painted a slick and unbroken white, save for the code numbers laid on in heavy bands of black. The factory does it, and there is a purpose. The brilliant color stands out well in space and eases re-

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covery. The Satarii, on the other hand, use black, since it leaves their ships virtually invisible. That doesn't hamper their recovery operations. If a Tar fighter is unable to return under its own power it never returns at all.

I ask you, though, how one can hate a nation like that? Before you can love and before you can hate, you must at least have some things in common, some level, however elemental, where you can finally come to grips. A race that leaves its pilots to die, even when there's some chance of rescue, is too alien to merit emotion. My success in the war had not been born of hate, but of a constant, never flagging effort to stay alive. Had I ever diverted my mind to hating, the time that called on all skill for survival might come and find me wanting. That I could never allow.

All these thoughts drifted to me while I clung like a spider to *Night Killer*'s hull, as they had come to me many times before and have come to me many times since. I stayed out a little longer, pursuing them further, then left the fighter and went back inside, gratefully climbing out of the suit. Richards entered a moment later.

"Need help," he said by way of explanation. "Got some tricky corrosion. Come on."

"Outside?" I said, standing amidst the discarded carnage of oxygen packs and fabric. He laughed.

"Sorry as all hell," he said, "but no, it's inside. Don't even need respirators. Hurry up; I'm gonna want my sleep tonight."

"I'm coming," I said, pleased by the change. "Glad to have you sober."

For all practical purposes, Richards' ship was identical to mine, but a deadly difference showed beneath her skin. The firing connection to his port missiles had rusted through.

"Water-based fluid, dripping through here, from the hydraulic system," he explained, indicating the area with his flashlight. "Patched the leak all right, but I only got two hands. Need three for fixin' this rusty mess."

"Use mine," I said, and we got to work.

Time-wise it was no great task. I held the wiring in place while he worked the solder gun, and within minutes the connection was restored. Rust remover cleaned up the corrosion, and then we backed out of the ship and into *Polar Star.* Richards grinned and shook the soldering gun.

"Say," he said, "sure nice of Stephy to make me check the old tub out. Would've been dead, sometime or t'other."

"Would have been dead tomorrow," I told him. "Twenty-third Squadron's jumping, and you were right. We're bombarding Lot."

"You don't say," he grinned. "How'd you find out?"

I recounted my brief meeting with Stephens. Richards listened without

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comment, still grinning, but something in his face took a darker turn.

"And how's this greeny friend of yours making out, then? That bottle knock some sense in, maybe? Hell, he should've fought the bastards! I wouldn't take that guff."

"You," I pointed out defensively, "are a five-year veteran. He's a civ. First time I messed with the Army they laid me out for dead, and that was after Basic."

He raised his light eyebrows.

"All right. Don't ruffle your feathers, Smithy. But now, who got laid out this time, Army or you? I thought setting up that first fight might do it, but hell, it took some greeny civ—'scuse me, some Federation citizen—to get you down. What's it like to live some, Smithy? You like?"

He finished stowing the gear and we started toward the R&R lounge. It was another bull-session night, but suddenly I wasn't at all sure I wanted to go. The thought touched me that I had had enough of Richards for the day, too much, and I stopped as we passed through Bunk Complex C.

"I'm not going to the session," I said. "Give my regards to the aft crew."

Richards' eternal, cockily challenging grin slid onto his face again, but he couldn't manage a wink with his blacked-out eyes.

"Sure thing," he said. "Just gonna tell 'em how you pounded the Army."

He sauntered off, and I made my way to our quarters. It was still early, as far as shiptime went, and I wasn't feeling tired, only frazzled, fed up with the war, with people, with the universe. I tried to write a letter home, but could put down nothing that the censors would approve. A return to the conflict tomorrow, as if I hadn't had conflict enough already. Finally, still wakeful but at the end of my endurance, I went to bed, an hour before the official Lights Out.

IV

On August 21, 0400 hours Terran Greenwich, while civilians across the Federation muddled drowsily toward dawn, the Twenty-third Squadron jumped. With us were two lesser elements of the armada: the Third Flotilla—eight destroyers, two light cruisers—and the distinguished Seventeenth Squadron—six heavy cruisers. We jumped in penetration formation, Third Flotilla strung out in a loose screen around the core, Seventeenth Squadron posted as second defense line, and the Twenty-third tight-packed in the center. I never said this is easy to picture, especially when accommodating a third dimension, but if this is any help you can go back several centuries to the last global war on Terra and stand on a bunker looking up into the skies over Germany. Way up among the dense black clouds left by flak is a tight wad of B-17 heavy bombers in box formation, flying in such a way that their bris-

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tling guns cover and re-cover one another's soft spots, forming murderous cross fires in every direction. And just above and below that flying fortress box you have a flock of fighters ready to fall on any Luftwaffe interceptor that tries to slice its way into the bomber pack. And way out ahead and on the sides some daring pilots are whipping their pathfinder aircraft through the storm fronts of antiaircraft fire, while a scattering of other fighters range far from the flock to give warning of closing Messerschmits. And when you have that in mind you also have our battle formation, jumping *en masse* from positions off Garr. The B-17's are battle cruisers, the standby fighters make Seventeenth Squadron, and those far-flung scouts and pathfinders are the destroyers and light cruisers of Third Flotilla.

So this is the way we jumped: one blink and Garr's great, swollen sun hangs heavy some thirty million kilometers off our stern; another, and the dwarfish star feeding life to Lot stares blankly into space nearby. Slowly the on-board sensors click to life, and slowly we orient ourselves, and slowly but with increasing speed we're swooping toward our prey. Weapons unlimber, train on drones for last-chance practice, technicians check sky-to-plant missiles, generators scream, send vibrations shaking down *Polar Star* as reserves are built in the power cells, and far out, a hundred thousand kilometers out, the destroyers search for Satarii prey.

We expected no major opposition beyond the plant-based defenses, since Intelligence placed only four small ships in the system. Of course, we had no doubt that these Tars would attack—the enemy has never bowed to superior numbers—but we had more than enough strength at our disposal to deal with anything short of a fleet wing. It was possible that the Satarii might stage a mass jump-in, but precedent and logistical practicality nearly ruled this out on a spur-of-the-moment basis. Our penetration wouldn't warrant it. Later, perhaps, when the rest of the Navy followed us in, but certainly no sooner than that. We assumed that the Tars would trust to planetary defense and whatever they had close at hand, and we were proved out.

An hour after arriving in the Lot system, destroyer *Anzio* reported a deep-space contact and began falling back toward our core. Seventeenth Squadron dispatched two cruisers, two additional destroyers shifted into an encirclement maneuver, and the fighting ended before it began, leaving the Satarii vessels peppered across a thousand cubic kilometers of space. There had been a small patrol boat, a lightly-armed courier, and a naval transport. The alienness of our foes struck home with a vengeance. A value system that could see an unarmed transport crew attack a major task force was beyond our comprehension. Perhaps they had hoped to ram.

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But the greatest danger as far as we were concerned was yet to come, and when it did it would be from Lot herself.

Picture your bombers now, arriving over Germany with minimal losses. Black flak clouds pockmark the sky, but the aircraft continue, serenely oblivious, bombs primed and crew confident. The country below knows death is coming and huddles helpless in shelters and subway tubes. The bomb-bay doors yawn open. The target is very near.

And on a ring of airfields around Berlin, the harried mechanics role out their final weapon, a rocket plane, the Messerschmit 163 Komet. Speed and performance: extremely high. Rate of climb: extremely fast. Armament: extremely heavy. Pilots: only one. Komet alone cannot stop the bombers, but it outclasses the protecting American fighters. Komet will get through the screens, be able to damage, or perhaps destroy, a plane or two. Berlin will be bombed—there is no helping that—but the price to be paid is blood.

And on Lot, as the Twenty-third sped serenely on in box formation, its defensive batteries primed and ready, its laser weapons covering soft spots, as we, reactors throbbing, cleared our decks for action, the Satarii ground crews dragged their "Komets" out. Near-space interceptors, set on boosters in hardened silos, their lethal sixty-foot arrow shapes enclosed in clamshell nose cones, in these the Satarii pilots waited for battle to begin.

On Hifendel I had the good fortune to examine an unused Tar interceptor and the launch complex it came from. Since they are planet-based, the pilots operate at a distinct disadvantage for the first few minutes of battle. The little ships cannot space on their own, and are carried through the atmosphere on old-style chemical launch vehicles. During this crushing ascent, a single missile from our fleet could knock out pilot, ship, and all in one low-yield nuclear blast. Thus it is the common practice for the interceptors to be launched while the target is still several thousand kilometers off, well beyond gunnery range.

Once the fighter is released, though, the advantage is all Satarii. A destroyer is so awkward in comparison that the interceptor can literally fly rings around it. They dash in like German Komets, spry enough to dodge our missiles, pulling maneuvers that would wrench a larger ship apart. To fight these mosquitoes you need a craft that can match them and more. That is where I come in. Fire of necessity fights fire, and the anti-interceptor groups are Federation flint.

At 0700, four hours from bombardment orbit, we filed into the ready room, tensed and seeking blood. I retreated into a corner, outwardly sulking, inwardly steeling myself to the task ahead. Coldly I crushed my finer feelings, covered

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up my sensibilities, blanketed the emotional surges of my mind. In the bull sessions I had earned a certain cavalry image by riding to the aid of beleaguered debators, but before and during battle I was Buddha, as impassive to the eye as the serene bronze statues tarnishing green in Terra's Orient. I was more than Buddha; I was Machine, my computer banks programmed to a single word: survival. And if the optimum survival operation entailed clearing the sky of potential dangers, then I would accept the killing to stay alive.

In this manner of preparation I happened to be alone. The others spent their last dragging minutes inflaming their hatreds, submerging their fear of Tars and vacuum in bitter, acid passion. Many had real reason to hate the Satarii, reasons transcending the gamble of life and death, but still I counted it a fool's reaction. In my first combat sorties I had followed the same course, until once, while hotly pursuing one fleeing Tar, I had been blind to the second coming in on my tail. That time I had been lucky and survived, but luck will obey no master and I could never count on it again. Instead I did without.

"Oh, God, gonna get me a Tar this time 'round."

Richards ran through an elaborate parody of prayer.

"Oh, my Father who art in Heaven, give me this day my daily Tar, and forgive him his trespasses since God Almighty, *I* don't intend to!"

Sanderson of N73 shouted the amen. The rest of the ready room joined in.

There were more than just the four aft pilots present at the time; each ship had two handlers to help it space, and the very words "fighter pilot" exude a glamor strange to war in space. Crew members stuck with duller tasks drifted in to stare, like peasants pausing in their fields to watch the knights go by. Stephens humored them; I repelled them, scowling with my eyes half-closed. And yet, I felt nothing in particular within me. Random thoughts ran through my mind, connected vaguely with the raucous activity on all sides. "Richards," I thought, "Buddha-Smithy blesses you not. Not at all, Richards, not you at all . . ."

"Pilots!"

The intercom burst awake.

"Pilots, board your ships. Be prepared for immediate scramble orders. We are within range of Lot-based interceptors; attacks are considered imminent."

I got to my feet. My wingman was whistling the Federation battle song while gathering up his gear. He was also clowning for the onlookers. I walked over to the knot of people and pressed my way through. Richards was on the floor, groping for a tube of food concentrates. He surveyed my feet, then carefully ran his gaze up toward my face, pumping each moment for comic effect.

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"Richards," I said, "speed it up."

"Well, Smithy," he drawled in reply, "what are you so all-fired excited about?"

There was general laughter, which I refused to acknowledge.

"I could always have Johnson for wingman," I said instead. "I don't *need* you, Richards. I hope you don't think I particularly care."

I made my way to the door and left without checking reactions, but he was on board his ship almost as quickly as I.

V

Night Killer II was not a beautiful vessel. Satarii fighters are sleek, polished for planetary re-entry, but a space-based interceptor need not be aesthetic. Had I attempted to land on Lot I would have reached the surface in ashes. *Night Killer* carried her missiles outside the hull in two cylindrical bundles. Radar sweeps and communication aerials were all exposed. Her drive was set on unstreamlined pylons spaced about her stern while the cockpit glass bulged beyond the curvature of her skin, ostensibly for wider vision with less distortion; the effect on the casual observer was that of a mutated hornet's head. And added to this were bundles of thrusters placed strategically about the hull to aid maneuvering. But regardless of her ungainliness, she remained an effective fighting unit, equal and in some ways more than equal to the darting black war craft of the Satarii.

I made a quick run-through of emergency procedures, then hooked my suit into the ship's life-support system. After a moment's hesitation I stretched out one gloved hand and seized an inconspicuous switch. Another pause, interminably dragging, and I forced myself to flip the toggle. *Night Killer* hummed softly, jerked momentarily, and lay still. The air lock had closed. I was divorced from *Polar Star.*

For the first time since boarding I looked beyond the cockpit glass. Lot was assuming impressive size and hung virtually free of clouds. The continental outlines were as sharp as our meteorologists had predicted. Bombardment conditions were close to perfect.

"N70, report."

"Smith, N70, reporting."

"Smith, you read us loud and clear?"

"Excessively loud and clear, Battle Command. Assuming the same at your end."

"We read you, N70. Systems check through central bank gives you go, N70, green all systems. Assume all go at your end?"

"All go my end, Battle Command."

"Fine, Smith. Ready for com-link with N71?"

N71 was Richards' ship.

"No, B.C."

"Grin and bear it, Smith. He's your wingman."

They plugged me in.

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"'Lo, Smithy," came Richards' voice. "I'm coming through over there? Loud and clear, Smithy?"

"Yes," I answered curtly.

"O.K.," he returned lightly. "I won't talk much. But friend, if I get in trouble, boy, I'm gonna shout loud as hell, you hear? And if you're stuck, why, you just call old Richards, you hear?"

"I hear, Richards. Just get yourself out of this alive. A dead Tar for a dead pilot's a loss, not a gain. Do *you* hear, Richards?"

He laughed.

"Yes'm, mother, I'll do just that. Just don't you worry your little head about it, O.K.? Only stands to reason, me being such a good boy, you know?"

He laughed louder; I sat, slightly amused by my lack of amusement, while *Night Killer* clicked softly to herself and the minutes crept by. When I glanced at Lot she seemed perceptibly nearer.

It was a fluke that I looked up when I did, a piece of purest chance. For as I did so five sharp, yellow flares blossomed against the dark green background and stretched out into brilliant pen strokes, quickly rising from the planet's surface and reaching out for space. I had no doubt of their nature.

Battle Command broke into our com-link.

"All fighters. Five bogies leaving Lot. Speed thirty thousand kilometers per hour and accelerating. Distance eighty thousand, six hundred and fifty kilometers. Fighters N64, N65, N66, N67 scramble."

I sat back in my seat. The forward group from *Polar Star* would handle this first sortie. Plainly, Battle Command expected more to come. There was no other reason for holding our elite aft unit back.

Far ahead of me along the jumbled length of *Polar Star*'s hull, sunlight flashed from moving metal. The magnetic fields holding fighters to battle cruiser had been reversed, and our anti-interceptors were being repulsed, shoved sideways into space. There was a second flash, brighter than reflected light, as the drive of one of the little ships caught hold, and moments later N64, as I assumed it to be from its position, had dwindled out of sight. In under an hour her pilot would be feverishly fighting for life.

"Shucks now," observed Richards. "They get all the fun."

For the next twenty minutes or so I watched the swelling planet, hoping to catch a second Satarii spacing, while occasional caustic remarks from our own distant pilots were funneled in via Battle Command. Both groups were still accelerating—the combined battle speed would be fantastic—and the speed of our entire formation had been increasing likewise. Lot had her gravity latched onto us and was hauling us in at over fifty thousand kilometers per hour. Sometime we would need to start

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braking, soon if we wanted a stable orbit.

"Missile-guidance radar contact," snapped a voice.

"Visual sighting, top magnification." That was N64.

"Roger. Pick your targets and watch the fifth Tar."

"Will do, B.C. Over and out for duration."

Silence then. I shut my eyes and tried to place myself in one of the closing vessels. Nine flyspeck warships were charging down each other's throats, hell-bent on destruction. The Federation pilots were placing the battle into the hands of fantastically skilled computers, linked to guidance radar and, finally, to the missiles clutched in bundles beyond the hull. The Satarii, their mission complicated by planetary reentry, were activating the gear that would extend their own rockets beyond the polished, night-black skin, and would essentially match our moves thereafter. Perhaps one or two of the Federation fighters were braking, to get a chance at pursuing however many Tars escaped, but the more usual practice at the speed they were traveling would be to continue on to parking orbit around Lot, where the task force could recover them later. There were still forty-four anti-interceptors in reserve, for only *Polar Star* out of the six battle cruisers had unleashed part of her brood.

"All pilots! Four bogies leaving Lot. Speed, thirty thousand kilometers and accelerating. Distance forty-four thousand. N54, N55, N56, N57 scramble!"

"N64 reporting. Bogie destroyed! No damage."

"N67 reporting. A-O.K., B.C., will proceed. Ditto, N66, B.C."

"N62 report! Report N62!"

"All pilots! Two bogies closing, range twenty thousand, speed forty-three thousand. N58, N59 scramble! Repeat—" They overrode themselves. "All pilots! Four bogies leaving Lot, speed twenty-five thousand and accelerating, distance forty-two thousand, five hundred. N40, N41, N42, N43 scramble!"

The reports piled out, too fast to follow. I ignored them as best I could, waiting. If any directives were issued to me, Battle Command's computer would isolate it and feed it into *Night Killer* without interference. Only then would I have cause for worry.

"Scramble N84, N85! Bogie five thousand kilometers, bearing on *Dog Star*. N84, N85 scramble!"

A penetration! *Dog Star* was below in formation, the second nearest battle cruiser, and that Tar fighter had her nailed. Fighters couldn't stop him at five thousand. It would fall to ship defenses.

A defensive-battery pod, held off the hull on a fragile pylon, rotated forty-five degrees as identical motion along the length of the ship sent reflections flashing ahead of me. Laser weapons trained on the oncoming fighter as missile launchers uncov-

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ered themselves and tracking radar swung ponderously around and downward.

"Bogie, twenty-three hundred!"

Instantly *Polar Star* was alight, from stem to stern an elongated sun, spewing fire into space. Just in time, I snapped my suit visor into place as four missiles were launched directly ahead, their exhaust splashing over the blast shields. I imagined the Satarii pilot, gyrating his craft to throw our gunners off. More flashes came from below, from *North Star,* from above, from *Dog Star.* Fearsome cross fire! The Tar was bucking our broadside. Searing dazzle at tremendous distance!

"Bogie destroyed."

Lasers lashed out to catch his missiles, launched at the moment of immolation. More starbursts, closer still! "Battle damage ship-to-ship missiles, contact *Dog Star.* Hull penetration aft, minor. Defense pod A3 inactive. Able to continue."

And abruptly the communications snapped off, leaving me in a foreboding vacuum. I tensed; this should be it, but to my surprise it was Captain Stephens who used our channel instead.

"Fighters N70, N71, N72, N73. This is your ship commander. It is without hesitation that I inform you that you four men are considered the finest fighter pilots in the Combined Fleet. This is a fact, to be accepted as such, as is the following. Intelligence intercepts indicate that the Satarii Empire has instituted a new point-defense policy involving the movement of crack interceptor teams from home-world defense to frontier planets considered especially vulnerable to attack. Lot is one such world. These teams are expected to weaken our task force defenses to such a degree that lesser-skilled pilots will stand an improved chance of penetrating to attack range. With such a mission assigned, it is obvious that the defense system they are to weaken is that of our anti-interceptor cordon. That is you, gentlemen, you and your fellows. However, your missions will not be task force protection. You are to be the hunters, not the hunted. If and when Satarii interceptors of an unusual nature are encountered, you will be dispatched to handle them. So far all enemy craft have displayed normal attack procedures. Destroyer *Agincourt,* however, has radar contact on a large object following a high-altitude elliptical orbit. There is as yet no reason other than prudence to view this as other than a spent booster, but a possibility exists that several enemy fighters have locked together to form an inconspicuous piece of 'debris.' Until further confirmation, you will be held back, but should you be released, bear in mind that those you engage will be among the finest the Satarii Empire can muster. Best luck and good hunting, gentlemen, when and if. Over and out."

The connection broke. Richards whistled.

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"God damn, Smithy," he said. "You hear that?"

I mumbled an affirmative, and suddenly he really was praying, harshly, insistently. I tried to shut it from my ears, revolted.

There is a certain aspect of terror in space itself; add to it battle, unexpected decompression, the searing death of a direct hit, the loss of communication gear, the hit on the drive that kills one's power, add all these, and balance them only with a heavy, quick, and painless gun, sum it up and total the score, and what you have left is the greatest nemesis a pilot can meet. Fear. Fear of space, fear of battle, fear of Satarii, fear of death. A discreet but acknowledged struggle was fought for the right to become my wingman, for never, not so long as my own ship could fight, had I allowed a partner to die. Men built hatreds to cover their fear, and I overrode it by being Machine, and which is better I leave to you. What matters most is the end, for uncontrollable fear means inevitable death, and in space the means are of little consequence.

"Smithy! You watch out for me, you hear? You hear!"

"Richards," I said coldly, "you know me better than that."

He was silent, then Battle Command filled the gap.

"N70, N71 prepare to scramble; coupled bogies, polar orbit, altitude nine hundred and fifty-three kilometers. Speed eight thousand kilometers per hour. All other fighters remain clear. Repeat, all other fighters remain clear. N70, N71 prepare to scramble."

Stephens came back on.

"Smith, Richards, take care. We want you back again."

"I want me back again," I said.

"Smithy'll make sure," muttered Richards, then lapsed into semi-incoherence. "Tar bastards!" he cried suddenly. "God, Stephens, let us *go!*"

"Stifle it," I snapped. He stopped. At this moment I was commanding, and only I.

"N70, N71," continued Stephens, "language is pardoned. Good luck, gentlemen. Cast off."

For a moment I felt a surge of horror come sweeping up my throat, carrying all before it, and with cold fury I clutched it, wadded it, flung it from me into space. Emotions now were Eden's apples. I had no wish to fall.

I punched a control on the panel before me, and the electromagnetic coil along *Night Killer*'s belly abruptly reversed polarity. The same forces that had held us together through battle and hyperspace rejected us now, flung me and my ship away from *Polar Star.* I slid sideways, still matching the warship's forward velocity, as the curvature of her hull became more apparent and the sheer massiveness of it diminished. I looked to port and saw Richards falling away also. I lifted the mike.

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"Richards? Smith here. Give a side burn and close on me."

His port thrusters flared briefly and his ship moved rapidly closer. With a small burn of my own, I rolled *Night Killer* ninety degrees, aiming her belly at N71.

"Fine. Now brake to three yards' station-keeping, roll your coil toward me, and we'll couple on magnetics."

Carefully we narrowed the gap between us, then our magnets drew us together, clamped us tight.

"Fine," I repeated. "Let's go."

Matching accelerations, we eased the drive up a notch at a time, beginning to run forward along the length of *Polar Star*'s hull, now a good kilometer distant. Sunlight blazed and dripped off her multifaceted reflecting surfaces. From astrodomes on the weapon-pods tiny figures watched us go, waving. A light blinked near the control center: "Good hunting." To humor them, I maneuvered us through a barrel-roll, then began to pick up speed in earnest. A twenty-second burn on the beam thrusters angled us off our path, starting us on a roundabout route toward the Tars' orbital path. Looking back as we turned, I could see the six ungainly capital ships in their box formation, braking rockets firing now to slip the flying fortress into bombardment positions off Lot. Battle Command was silent; apparently all the interceptors had been dealt with, excepting only our prey.

I aimed a tight transmission back at the squadron, hoping the Satarii would not pick it up.

"Battle Command, this is N70. Give me a radar bearing on the bogie."

The answer shot back immediately. I translated their figures into my shipboard computer and passed them on to Richards. That done, I hooked my tracking radar into the banks and instantly had the enemy on my screens. They were a good eight thousand kilometers away. However, we were moving at close to fifty-six thousand kilometers per hour ourselves, and, had we driven directly in, there could have been contact within eight minutes.

Perhaps that was the course we should have followed, but I think not. The difficulty with such a maneuver is that, once the initial firing run is completed, the time wasted in stopping, reversing direction, and building up speed again is prodigious. Before we could catch up with any Tar fighters that escaped, they would be pressing home attacks against our battle cruisers. I personally felt that, intended as dogfighters or no, if we left our squadron wide open they would not hesitate to plunge in. And besides, there was a point to put across.

If Intelligence was correct and we *were* up against the enemy's varsity squad, then it was almost imperative that we make an object lesson of them, assuming, of course, that we could.

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I guided us through a tremendous parabola that would bring us, with more maneuvering, into position behind the target ships. They were apparently still joined together, just as Richards and I were, but it was obvious from the radar screen that destroyer *Agincourt,* one of the most extensively outfitted ships in the fleet for intelligence-gathering operations, had closed enough to make a visual confirmation. I wondered briefly that the warship had not launched a long-range attack; perhaps Battle Command was seeking an object lesson, too.

"Smithy," demanded Richards, "when are we gonna break up?"

"Last possible moment," I told him. "Maybe they'll think we're a patrol boat sent to check them out. Then, when we get too close and they have to fight, we separate and they'll find they've got more than they counted on."

"Real sweet," said Richards. The fear was gone from his voice, routed by bitter hatred. "Long as we're coupled the bastards just got one big blip on their screens, eh? That's devious, friend. Kinda fitting for them."

I grunted in reply. Hot emotions can be contagious, and I wanted none of my wingman's virulence.

We completed the parabola and started to close. I had braked our speed to sixteen thousand, giving us an effective closing speed of eight thousand kilometers per hour. The Tars were only some four thousand ahead of us as we slid into their orbital track. Half an hour to contact, then. A thought occurred to me.

"A new idea, Richards. Be ready to separate whenever I say so, whether they've made a move or not. If we jump them as two separate fighters while they're still coupled, it's our advantage all the way."

"Right," he said, with surprising economy. It sounded as though his teeth were clenched.

At about two thousand kilometers' distance the Tars, considering their small size, would be within range of our standard visual equipment at top magnification. This they undoubtedly knew, having seized our equipment before, and were probably waiting until the Federation "patrol boat" had almost reached that range before they revealed their true nature and jumped their pursuer. What they couldn't know was that destroyer *Agincourt,* picket and long-range penetration ship, carried far more than the standard optical gear, and that the "patrol boat" was not a scout, but a hunter. Thus we could probably get quite close—maybe twenty-three hundred kilometers would be about right—then release our bondings to become a pair of highly maneuverable anti-interceptors before our foes could do the same. If so, we would catch them while they were still separating, and probably handle both in a single run. Richards seemed to follow my reasoning, singing and cursing with easy confidence.

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The distance narrowed. On the radar screen the fluorescent blue dot that was Us closed on the sharp white dot that was Them, while right on the edge our task-force cluster was fading out of the picture. The Tars had better be dogfighters, since they'd never catch Twenty-third Squadron now.

"Richards," I said, "be ready to separate on a count of five with immediate acceleration."

The gap shrank further. Considering the enormity of space, the distance between us was minuscule. I checked the screen a final time and made myself as comfortable as possible.

"Five," I said, "four, three, two, one, now!"

I thumbed the coil control and *Night Killer II* leaped sideways. Through the single port in the cockpit floor I saw N71 doing the same, sunlight flashing from her missile bundles. I pulled steadily on the drive control while correcting sideslip with a port thruster burn and acceleration crushed me through the seat.

By the time my visual screen had snapped on I needed only low power. The two Tar fighters, night black, were still jerking apart, their engines flaring in unison. I punched in the missile-guidance computer, slid my hand to the firing control, and pressed it, once, twice. Four missiles shot forward, two to a side. My tinted faceplate swallowed the glare as *Night Killer* angled from her orbital path, riding a starboard thruster burn. A Satarii war craft loomed in my visuals, spinning to throw off the first salvo, and I pressed the controls again. This time there was no escape. A nova blotted out the stars as my belly thrusters fired and shoved me over my enemy. I continued to accelerate, outrunning fragments, but rolled as I did so for a better look back. I was in time to see a second star burst apart and caught the fleeting silhouette of a ship passing between me and the explosion. "God damn!" thundered in my earphones; Richards' triumphant battle cry.

As quickly as was safely possible we rendezvoused again, flying formation with two kilometers' separation. Radar registered only a single object anywhere near us, though fragments were radiating with frightening speed. One Tar fighter had disintegrated, the other only partially.

"Let's check the bastard out!" howled Richards, and we burned thrusters to close.

VI

The wreck was unimpressive. Without engines running it proved impossible to locate with visuals alone and we had to creep in on radar, unable to see a thing until a hundred yards away. That is why the Satarii use black; our own white ships stand out against the sky like beacons in comparison. We stayed just long enough for Richards to

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slake his appetite somewhat, then climbed back toward the orbital track.

"N70, N71, report!"

The cryptic call yanked us back to our senses.

"Smith! Richards! Report!"

Captain Stephens himself, I noticed, then flipped on my own transmitter.

"N70 acknowledges. Ditto N71. Bogies destroyed. No damage. What next, Stephens?"

"You wait, damn it! We're so far ahead of you that we're having to relay through N54. We'll pick you up in one and a half orbits."

He gave us new orbital coordinates. If we slid into these new tracks and braked to ten thousand kilometers per hour, they would reach us in about ninety minutes. That done, he cursed us for failing to report immediately and broke communications with a parting epithet. We were on our own, with the fleet half a world away.

"Smithy."

Richards intruded on the comlink.

"Smithy, your screens working O.K.? Cause I've got two blips on polar orbit, friend, and I sure hope to hell I'm wrong."

I checked my own radar quickly, berating myself for letting my attention lapse, and found that Richards was right. Two large objects registered on my tracking radar, cold white, riding southern polar orbits. They were too large to be single Tar fighters, but then again, they seemed a good match in size for pairs of coupled bogies.

"Sorry, Richards. I have them, too."

He remained silent for several moments while the two blips drew almost imperceptibly nearer. One was nearly at our own altitude, proceeding at close to sixteen thousand kilometers per hour. The second was no more than three hundred up and moving at about twenty-three thousand. The shipboard computer gave me the answer I expected. If the three of us maintained our speeds there would be a general rendezvous in forty minutes. That seemed to be stretching coincidence a bit too far.

"God Almighty, Smith! The fleet's gone and left us!"

"Not quite," I returned. "We rendezvous in ninety minutes."

"The Tars get us in forty, Smithy!"

"Correct that, Richards. We get them in forty minutes. We have the initiative and we're keeping it."

He had no immediate answer for

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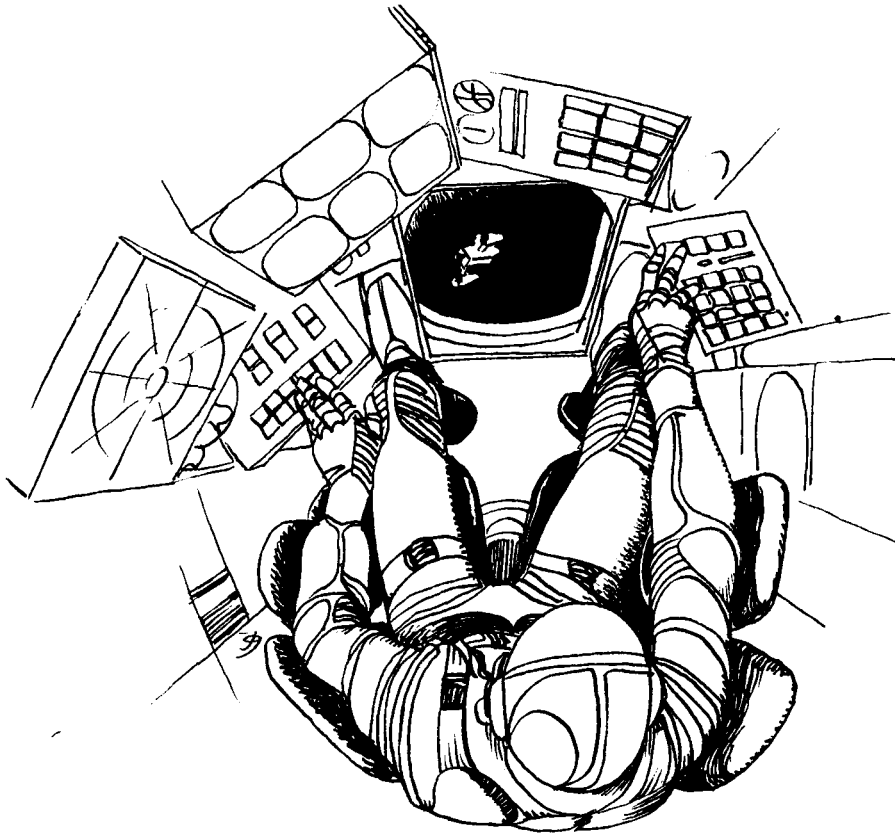

that, but I took his silence for something less than agreement.

In all honesty, the odds did not look good. I was reasonably sure our companions were four Tar fighters, perhaps trying the debris subterfuge again. If that was so, their dead compatriots had tipped the hand. The minutes dragged slowly and ceaselessly by while the stars hung overhead and Lot's moon set behind us, infuriatingly unconcerned. The planet below was a gray mass, undistinguished by any lights. We were over the night side, and probably over the ocean side as well, but that merely explained, did not temper, the emptiness. Far on the horizon a brighter band showed we were overhauling the day. By the time we reached it, though, we would have other things on our minds. We con-

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tinued to wait, helpless before the cold laws of physics and fate.

This was the deadly time, the crucial time, that more than once had decided the course of battle. War in space is a war of skips and jumps, of short, savage hops and long, nerve-racking parachute drops with the hard earth swirling up to crush and swallow one's fragile form and a thin, fabric sack in a canvas roll giving all one's margin of safety while the sky driver watches his harsh, mistress planet waiting hungrily to reclaim her own and wonders whether that white canopy will bang open above his head in time or whether the seams will rip apart, the cording twist, the gods guffaw with pleasure and send him to his death. We were jumping now. In twenty minutes, a little more, we would see action, for a short, savage minute, perhaps two or three, perhaps a little less, and then we would wait again, drifting in limbo while fear and doubt clawed at the bulwarks of our minds and tested the strengths of our walls of hate, of duty-to-country, of machine-like efficiency. All the wait, while the mind pulls taut and the body knots in anticipation of the short burst of action that will make or break our lives. Here is where the battle is fought, the true battle to which combat is but the aftermath, the ending happy or sad.

Once, when man first took to the air, the waiting was short, the combat long. The biplanes and triplanes, with turning circles half the length of *Polar Star,* could stay in contact till fuel ran out, with never more than five minutes between firing runs. Then came World War II, and combat sprawling over countries and states while speeds lunged toward a thousand kilometers per hour and time between action doubled, tripled as the pilots, fighting to turn their planes around, swept miles beyond the field of battle before inertia could be bucked enough for return. And then man broke the sound barrier. The MacDonald Phantom closing on the Mig, radar contact at sixty miles, the pilot inactive, his plane fighting for him as minutes drag, then contact, a shock of missiles, a blaze of fire, and he's fighting the rudder and ailerons, trying to make it around one hundred and eighty degrees of a turn before sliding into Chinese airspace a hundred miles away. A fistful of seconds for an armload of time. And then into space. Forty minutes' wait while we watch those two fluorescent blue blotches converging across a quarter of the sky, our computers tracking, our nerves tensing, waiting for the five-second explosion, the reflexive punch at the missile control, and then empty sky ahead again, the enemy fading five hundred kilometers back and losing fast, your forward thrusters blazing to slow you down, to allow you to turn at a dead stop, to overcome inertia and rebuild the G-force to send you screaming back to the fray, the time between contact

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ten, twenty incredible minutes. And every moment of waiting, while the heat of battle subsides around you, gives you time to think of the dangers you are in, of the dangers just survived, of the dangers you are plunging toward once again. For just a minute between battles, or less! For something to keep the mind a blank till it's needed to handle the stick! But it can't be done, and for ten minutes, twenty minutes, forty minutes, eyes riveted to the screens, you stagger beneath your load of fear. This is where battles are lost and won; this is where our battle was being fought, as the distance between us and the Tars narrowed and the minutes made their slow way by. I checked my screens again.

"Our friends are getting close."

"They hit us in twelve minutes, Smith! What the hell are you *doing?*"

"Clam it, Richards. They want us to think they're debris. Fine. We let them think we do, right up to when we kill them."

"Sweet and simple," he sneered, with a voice that left no doubts about his feelings. Sudden death in an empty sky must have been weighing heavily on his mind. I had some doubts myself, but I wasn't about to let him know.

Yet, in point of fact, I wasn't frightened. That was the goal of my emotional conditioning, and that was a goal I had achieved: to be able to judge objectively and clearly in a stress situation. My mind was doing exactly that, even as our spate of conversation ran its course. We were probably outnumbered by enemy fighters, yet, as far as the Satarii could know, we had fallen for their trap. They might suspect otherwise, but their subterfuge had tied their hands, putting them in a position of having to carry it through on the chance that we were well and truly deceived. That meant they would probably stay coupled together until we closed to visual range. Furthermore, Richards and I were already separated, would not have to waste time disengaging when the moment to strike arrived. Two of the Tars should be put away with ease.

The trouble lay in the remaining pair. Pulling off from our first firing run would put them on our backs.

"Richards. Roll planetside as soon as you fire and slow to three thousand, fast."

"You're crazy, Smith! Damned if I drop speed for Tars!"

"Richards, you slow down! They won't expect it and they'll overshoot. And the slower we go, the tighter we maneuver. So follow!"

Again he made no answer and I expected none, but I also expected him to follow. I was his flight leader, and I had never lost a wingman.

The bogies sped closer, verging on visual range at two thousand. The time could never be riper.

"Go!"

I jammed the stick forward and G-pressure crushed my face to an African mask, stretched and distorted.

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The firing computer locked onto target; I fired, and slammed *Night Killer* toward Lot as sudden lightning blazed about the canopy. My forward thrusters were burning fiercely, jolting my speed to a comparative crawl; the G's released me as the rockets cut off and inertia took over, speed thirty-eight hundred kilometers per hour. I checked the screens and confirmed that Richards had followed.

Then I stared at the screen again. One of the bogies was still in the air! No ship flying should have dodged our strike, not unless some superman rode the stick.

"Smith! Act, damn it!"

I came to my senses, swearing. The range on the second fighter group was streaking toward one thousand, and to my dismay they had split, not into two, but three attacking units.

"Richards, hit right flank, then brake like mad and go for the one behind us. Keep your speed down; you'll want to maneuver."

And they were upon us, or rather we were upon them. They had not expected such an insane attack. *Night Killer* gyrated to dodge Tar missiles, slammed sideways as a ship shattered nova-like just ahead, and then we were braking and spinning on our axis to hurtle back into the fray. Two of three bogies were down, Richards was charging his prey with all advantages cornered and the last ship of the second group was still trying to brake, his control hampered by excessive speed. I closed and fired carefully, conserving ammunition.

That pilot was good! He jumped one spread, sidestepped the second, and only as he swam back into my sights a final time did a proximity fuse detonate the third. He dashed on, momentarily wreathed in freezing mist as air fled his punctured hull. I fired regardless; the pilot was probably suited.

He was. Streaking out from the sudden debris came the fighter's full load of missiles, too close! I shoved my ship planetside, while the warheads, bereft of computer guidance, streaked narrowly past my stern. Several fuses went off, but I was accelerating again and left the fragments behind.

"Smithy! God help me, Smith!"

I swung to the screen and caught a chilling sight. Richards' fluorescent blue blip was nearly a thousand kilometers off. So close as to nearly merge with him was a single white dot, matching every maneuver my wingman pulled.

Night Killer screamed angry protest as I jammed the stick forward and caught every G that I could stand. Equally hard, I braked her down toward in-fighting speed. The gap had narrowed to seconds' worth of travel, and Richards had somehow kept alive. Without pausing for breath I plunged ahead.

Port bow thrusters flared to angle me onto the Tar's wide tail and I had him in naked-eye range. I punched

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the firing control, sending two missiles streaking.

"Richards, roll and climb!"

He broke and tumbled heavenward; the coast was clear for my salvo, but too clear as the enemy rolled also and plunged planetside. I followed, but diverted half my attention to Richards.

"N71, damage report."

The Satarii was accelerating. I matched him and more, trying to close.

"Hull punctures, Smithy. Cabin decompression, but my suit's okay. He bracketed me twice; half my thrusters out; firing connections to missiles cut."

I was closer now, but not close enough for a sure kill.

"Get back in orbit, Richards. The fleet'll pick you up."

And the sudden realization of danger flooded my mind as my fingers, virtually of their own accord, braked *Night Killer* to her maximum, at the same time spinning the ship on her axis so that her powerful main drive faced toward Lot to shove me out and away. The Tar plunged on, retracting his missile rack and slicing deep into the atmosphere soup, now terrifyingly close at hand. I rode my main engines spaceward again, shaken. Another two minutes and I would have burned, reaching the planet below as ash.

I quickly plotted a rendezvousing course with Richards. The figures stubbornly refused to match. I wrestled with them a bit longer, then checked the radar to confirm my wingman's position. In such brief time remaining, I saved my life.

The first salvo exploded overhead, shatteringly close, causing me to dive even faster than planned. I ran an agonizing burn on the bow thrusters to brake my forward motion, all the while accelerating planetward again as multiple, conflicting G's strove to tear me apart. Another barrage and a wave of red lights sparkled across the panels. A sequence of ragged rolls, followed close by slowing descent and backward motion from the bow thrusters, and the danger was momentarily past. My attacker overshot, himself decelerating to spin about and finish the task. I began putting on forward speed again, pitifully slow as the ship fought against inertia. But with a little luck I could turn the tables.

That incredible devil! He had only dipped into the atmosphere to throw me off, then had shot back out to catch me unaware. The temperatures must have been fantastic; the skill to pull it off seemed preternatural.

But then, my own escape had not been commonplace.

I made a check across the board and found no less than six thrusters out. No wonder the shaky barrel rolls! My main communication link was broken, though Richards' tie-in remained unharmed. Lastly, the cabin pressure was dropping. I slid the helmet visor shut and

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immediately went on suit support.

Sudden movement across the radar screen caught my attention as the Tar fighter split off his course and skidded toward Lot. I increased my speed and followed, running a burst on the port bow thrusters to jolt me onto his path. Then he was braking, sliding sharply down the speed scale. I matched him and didn't overshoot; he sidestepped and I followed; he rolled, yawed, leaped, and I fired.

It was a four-missile spread followed by wicked braking. That way he would speed to dodge the salvo, and I would stay remorselessly on his tail, to catch him on his recovery. Just then, though, a blinding brightness swallowed the sky; we had passed from the planet's shadow and were now bathed in a dazzle of light.

Far ahead of me, almost lost against the glare, thrusters flared, and before I saw what he was doing the Satarii sliced his speed by half. My barrage overshot, I braked sharply to avoid overshooting myself, and of a sudden we were cruising side by side, no more than five kilometers apart, our speeds a perfect match.

The situation was ludicrous, likewise deadly. My survival depended on catching and matching any decrease in his speed. If I reacted sluggishly, his ship would fall behind and onto my tail. On the other hand, he could not accelerate out of the situation, since placing his unprotected stern in my sights would bring a quick and final end.

I looked at the screen to get coordinates, and set my visuals on the Tar. The picture tube presented a drab and featureless gray; a near miss had shattered the lenses. I was riding semi-blind beside a foe who had done the inconceivable—nearly destroyed me in single combat—and I felt a sudden and surprising hunger. Unable to resist it, I fired the remaining starboard thrusters and slid sideways toward my enemy.

I wondered how he would react. Would he think this some unusual tactic, some devilish new snare, or would his alien mind grasp a fragment of my thoughts? If the former, he would probably sidestep away, maintaining our distance and the uneasy status quo. And if not? I received my answer. The Satarii did sidestep, but toward me.

Tense seconds passed. To my left an orange fleck appeared. I stared at that. An *orange* Tar? It took a certain easy conceit, a confidence in self and ability, to defy traditions that way, orange over black, or green dragons painted on one's hull. I waited impatiently for the gap to close.

We neared until the cockpit glass of the other was sharply defined. Slowly we neared one another, until the scorches from his atmospheric dip appeared, until his nearly empty missile rack stood out with wintery sharpness. I had no doubt that he saw my own punctured hull and depleted ammunition. We drew still closer in a heavily somber air of mu-

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tual regard. Somehow we sensed in each other more than our different worlds and dissimilar minds, more than our incompatible values and clashing cultures. Looming above and beyond these was our common ground, our equal flying skill, so far above that of our peers and comrades that there could scarcely be comparisons. Ours was a third world, distinct from Satarii and Federation, the transcending world of masters of an art. As Steinmetz and Einstein met one somber, grimy day on Earth, in the grinding, impersonal canyons of New York City, as the two giants drew together, suddenly alone in the roar of the crowd, in an age when space flight was a dream and nuclear power the faint flicker of lightning lashing out at a far horizon, as for a moment they spoke, softly and quickly, whispering so that none but they could hear, so we came together now in the strife-torn heavens of Lot. Carefully I unstrapped myself and inched forward until the bulging sweep of *Night Killer*'s canopy left me exposed to view. I waited.

Across the twenty-meter gap, there was a trace of movement; then a suited figure eased into sight, taller and thinner than a man had any right to be, the helmet broader, flatter. His visor was shut, making me aware of the slightest mist of air escaping about his stern. Across the gap our faces were hidden; to expose them would have meant decompression and death, and yet, there was no real need. We understood without seeing, without the meeting of eyes.

The action came spontaneously. I grasped the firing controls and launched four missiles straight ahead, wasting their warheads in empty space. Again I waited. A sudden blaze from beneath my opponent's belly marked his answer. He, too, emptied weaponry into space.

It was the ultimate safeguard, tantamount to peace itself. We rode, disarmed, for stretching minutes, regarding each other through tinted masks. And finally, when all the time allowed was spent, we parted, he to spiral down toward Lot, I to ascend toward the stars and Richards and command ship *Polar Star.*

I realized then what was needed to end the war: five, ten, ten thousand meetings such as ours, ten thousand contacts between Satarii and Human, a few shared moments of contemplation and other-world companionship. And once one knew his enemy as a being, an entity distinct and separate from the shadowy shape behind a gun, one would find it hard to hate and fear. And without either one to feed the other, the fleets might then go home.

I wove a strange hypocrisy, perhaps. I returned to *Polar Star* with four more kills than when I had sortied; Richards returned plus two. Yet I had spared the most dangerous pilot of all—or he had spared me—because we could muster no hatred. But I had no feelings for his four

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dead compatriots, and these are facts not easy to reconcile. What, then, can I say, except that he and I were different from the rest, each ultimate pilots, each ostracized from his peers by his talent and joined with his enemy by the same. When *Night Killer* berthed on *Polar Star* and I made my weary way to quarters, Richards was farther from me than the Tar. I avoided my wingman's incredulous stares. He sensed what it was that I had done, and that private reconciliation, of any act committed or yet to come, was beyond his least forgiveness. A sweeping statement, but it was true, though there was very much more indeed to come.

VII

Our sortie was the last one of the bombardment. Thereafter the Twenty-third ranged alone off Lot, while the counterbarrages decreased in fury and our own thundered down as unadulterated as ever. The enemy was pumped dry; the last stubborn defender surrendered himself to fate; the inhabitants, turtle-like, pulled in upon themselves and waited for hell to pass. We slashed their world unmercifully, gouging the red earth deep about their colonies, sending our destroyers in lethal, atmosphere-skimming sweeps. Delicate feathers of smoke, or so they seemed to us above, rose miles into the air. Low-yield atomics reformed the planet; heavy lasers set forests ablaze and swamped hidden bases in flame. Mars ran roughshod over Lot, and finally, when the once-clear day was turned to dust, we reformed our fleet, broke our orbit, and plunged back into space.

Who knows what the Tars felt? Relief, probably, that the raid had finally come. It must have been expected, for the system was on the fringe of the empire and planets further in had been hit before. They would wait patiently for us to jump back to Garr, and then the messages would flow out for supplies, the black-hulled ships would return, and peace would hold sway once more. All just as soon as we left.

But the Twenty-third stayed.

A hundred thousand kilometers out we found a solar orbit and rode it, waiting, and at 2200 hours the Combined Fleet followed us in.

This is the way the jump looked. One moment infinite, star-spotted blackness, then three hundred sharp white flecks, above, below, in front, behind our ships. The fleet had come to stay.

And this is how it looked on Lot. The tracking-screens barren fields of green save for a clump of electric-bright specks hanging far, far, and safely away, then, of a sudden, a vast and all-encompassing cloud of dust motes, filling the empty corners of the sky. How, I've often wondered since, did the Satarii feel then?

I personally met with a great and pleasant surprise. Shortly after the fleet jump I was summoned forward

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to receive a communication. It took a moment for the source to register: HS *Jonas Salk.* And then it sank in like a rock, sank with a shock, turned me over with delight. Hospital ship *Jonas Salk,* commanded by Captain Benjamin Smith. I hadn't seen my brother for almost five years.

Benjamin, the only member of the family who had opposed my enlistment. "Immoral!" he had cried, "you crazy, immoral fool! Do you know what it is you've signed up for? Killing people! Killing, maiming, butchering *people*! That's what you've signed up for, you fool, and I know damned well you know it. Why!"

There isn't any answer for that, you know. Why should a man stand up and say: "Yes, I shall do murder as thou see fit?" I did it; that was all. And Benj had exploded. But we were brothers still, and good ones. In the end he'd followed, too. A good and experienced pilot like Benj could not be left rotting on the vine, and the war department had "requisitioned" him. But on his own terms. No combat. Command of the HS *Jonas Salk,* angel of mercy to the fleet.

"Tom, you old war horse," read the message, "it's been a long time. Can't operate in the war zone without hearing about you. You know I don't approve, but congratulations on surviving. Maybe we can get together, sometime or other. Benj."

I consumed it, read it a second time, and headed aft in high spirits, which was something that hadn't come often to me of late. Before leaving, though, I sent a communication back, expressing my hope for a good talk. I could undoubtedly wrangle one out, too; Stephens had not been at all displeased with me lately.

Richards looked up as I passed through the Section C lounge.

"Well, Smithy," he demanded, "what're you so all-fired cheery about? Push a deal with that Tar bastard, maybe?"

We were not friends in any sense of the word. If the issue had once been in doubt, it was no longer. "Friend," he had said, many weeks past, "the Tars are gonna go to hell, and I won't have none of your peace-pipe talk!" and now, in an unwritten pact off Lot, I had made that forbidden peace with his almost-killer. Richards was not merciful; he had assaulted my proverbial tower, and I had repulsed him. The next time around there would be no quarter.

"Well?" he demanded.

"No deals," I told him dryly, but even my wingman could not depress me now. "My brother came in with the fleet. Benjamin, on *Jonas Salk.*"

There was a brief silence; I'd told him of my brother's views, and he was sharp.

"Well," he said slowly, "that's real fine. Now we've got two Tar-loving bastards in the fleet. How many Fed patients he killed for the Tars,

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Smithy? Hell, just make sure the medicine—"

Then I hauled him from his chair and sent him spinning against the wall. The few others present turned and stared.

"Richards, you spit any more venom and I'll kill you! I can take your tongue, friend," I spat the word in his face, "but you're not going to slander the only *man* in this butchering Navy!"

I calmed myself, still keeping him pinned to the paneling with my arm.

"Don't forget, Richards. You've gotten me hating one person now, and by God you deserve it!"

I left, not for my quarters, but for Stephens' command post. When I returned I was no longer Richards' bunkmate. He would learn that tonight. He wouldn't learn until later that he was no longer my wingman.

VIII

The enemy responded to our assault with surprising force and speed. Two days after the general jump-in, the third wing of the Satarii Main Fleet arrived *en masse* to do battle. Twenty-third Squadron, with its six modern battle cruisers, was still replenishing from depot ships and could take no part, critically weakening the Federation forces when they could least afford it. Battle raged hot and bitter for nearly twenty-four hours before the Tars conceded the field. They had been overwhelmed, but merely by force of numbers, and ship for ship we had taken the worst of the beatings.

But despite our losses and the unexpected speed of the counterblow, tactical victory was ours. The defenders withdrew, licking their wounds, and the invasion got under way. Behind a screen of destroyers and light cruisers the fleet closed in on Lot.

First a line of light craft to render pin-point fire support. Then the assault transports, nearly warships in their own right, armed and armored and laden with coveys of landing boats. In a ponderous shell beyond this first wave hung the Twenty-third Squadron, partly for heavy gunnery, partly as flying airfields for our one-man interceptors. Next level out were the back-up transports, interspersed with warships there to handle any intruders, and also located in this level was the white-painted, cross-marked ex-liner *Jonas Salk*, ready to treat the wounded sure to come. Here was the invasion fleet, in synchronous orbit above the most battered land mass on Lot. A cordon of war craft was flung around the rest of the planet to restrict any flow of Satarii supplies, and the bulk of the Combined Fleet rode shotgun nearby, in case the Tar Navy tried again. The stage was set; the pieces were placed; the waiting war was about to end.

At 2130, four days after leaving Garr, *Polar Star* and her five sisters laid a final, blistering fire on Lot, and all across the planet fires bur-

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geoned anew. Smoke began to swallow the sky as hundreds of pin-streak flashes sparkled momentarily in the high reaches of the ionosphere, the glowing atmospheric entry of twenty thousand shock troops.

Riding in the cockpit of a refurbished, rearmed *Night Killer II,* I held a ringside seat for the biggest show in space. A few batteries, incredibly still intact, strove ineffectually to stem the tide, but our close-in destroyers ended the threat. The emptied assault transports began shifting back to the outer levels and the second-wave ships fell in to take their place. Communications crackled from the set: such and such a unit landing, such and such a boat destroyed. Two Satarii warships jumped in, to be caught by the battle fleet deployed for such a chance. The occupation had become irrevocable; at the very worst it could be made only costly, and no one had harbored any illusions about that.

"All fighters. Two bogies, range fourteen thousand, three hundred kilometers and closing. Speed twelve thousand, five hundred kilometers per hour. North polar orbit. Scramble N70, N71, N72, N73. Repeat. N70, N71, N72, N73."

I came to full attention with surprise and a strange feeling in my stomach. Two bogies? Risking an attack in a sky filled to overflowing with enemy ships? Beyond a doubt my orange opponent, and who else? Another perfectionist, most likely. With these thoughts occupying my mind, I coldly reversed the coil polarity and let opposing magnetic fields fling me from *Polar Star.* I lifted the microphone.

"O.K., Johnson. Burn port thrusters and rendezvous two o'clock off the main batteries."

"Roger, Smith."

I eased on a bit of power and slid forward along the cluttered hull. A slight application of the forward thrusters braked me back down to the battle cruiser's speed. The mass of midship battery three hung below my feet, a steel-plated dirigible, its smooth skin marred by the missile launchers, all of which were exposed for action. A minute later, Johnson drew up alongside me in N72. I mentally shook my head. A new wingman and a new working relationship to build. Richards and I had been a team of three years' experience, but a house divided cannot stand. If not agreement, there can at least be no antagonisms.

"O.K., friend. Let's go."

Together we accelerated and sidled away from the ship. We began to angle out of the great cloud of Federation vessels, still keeping in the congested sky. Then we were free and closing on the bogies, taking a low-altitude approach while Richards, now a flight leader, took the high. Four to two; it wasn't fair, except, of course, that one of the two before us was decked in orange.

"Fighters, this is Battle Command. Bogies' probable target area back-up

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transports and fleet-train vessels."

"Roger, B.C. What are you leading up to?"

"Patience, Smith. The Hifendel precedent. An attempt to knock out loaded transports and hospital ships, maximizing casualties. Don't you remember, N70? You were there."

Johnson chuckled. Richards probably sneered, but I no longer had a tie-in with him. Yes, I remembered. That drive to hit our medical centers had been another mark of enemy alienness. Only a people who could abandon crippled yet living pilots, only a people who would attack a task force with an unarmed transport, only a people with so little regard for the individual life as the Satarii could have brought themselves to attack the repositories of the wounded and maimed. To them it was not an infamous act. To them the wastage of Federation effort in recovering and healing the injured was an infamous act, for they themselves would have employed that effort in furthering the cause of the corporate mass of the species. Destroying hospital ships was perfectly acceptable to the Tars, and no doubt had been common practice long before they took to the stars. It was also a tactically sound practice, and we of the Federation had later followed suit, if not on our morals at least on their precedent. We were, after all, at war.

"Will perform accordingly, B.C., unless you say otherwise."

"Roger, N70. You'll be first contact. Try to stop them as far out as possible. Richards take inner defense. Go to it, and good hunting."

And that was all. We shifted course and ladled on the power.

On the screen, the Tars closed quickly. They were heading straight in—no deceptions this time—and so were that much less hampered. It would be tough.

"Johnson. If one Tar is painted orange, leave him to me. That fellow's hell on wheels."

"Roger, Smith," his voice sounded strained, "will do."

It was shaping up into a classic attack, straight from the textbooks. The two forces were approaching head on, our combined speed in excess of thirty thousand kilometers per hour. There would be time for one salvo, then the point of contact would be passed, with the enemy dwindling in the distance while we jammed the brakes and tried to turn around. I wasn't fond of textbook battles, but this time there was little choice. I would have rather sat stationary and let them charge us, which would have allowed more sustained and accurate firing, or even better, to move in the same direction they were traveling, using bow thrusters for my prime propulsion, which would have allowed continuous salvos until my missiles were expended, but such maneuvers would also expose me for a longer time, and I didn't think Johnson had the experi-

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ence to carry it through. No, it would be a down-the-throat charge, a colossal jousting match, and none of us carried shields.

"Johnson, forget everything they told you about conserving ammunition. Dump fifty percent of your load when the time comes, even more if you want to. There won't be a second chance. And as soon as you fire, apply maximum braking forward and full acceleration down toward Lot. And put yourself on suit support now, while you have time."

"Roger, Smith. How about erratic acceleration and deceleration once I'm heading planetside, to throw them off some more?"

I smiled tightly. He was a sharp thinker, with initiative. Other pilots would have been too cowed by Smith of *Night Killer II* to dream of speaking up.

"Fine, Johnson. Whatever keeps you alive. Over and out for the duration."

And then we were on the arrow's course, plunging straight to the dragon's mouth. The dots on the screen swam closer. I opened my repaired visual channels to save time when we closed to that range, and slid a finger onto the firing button. Two kilometers to port, Johnson hunched over his panel, straightened again, and in a fractional sweep of the second hand we were upon them.

A sudden glimpse of black and orange spaceships, the realization that I was locked on the wrong Tar fighter, and fire! A ring of flames shot past my cockpit canopy as my braking rockets thundered into space. I fell, top thrusters shoving me down toward the threatening atmosphere, a move the foe should not expect. More lightning split the stars overhead. *Night Killer* strained to slow and turn as the screens filled silently with ominous, spreading fragments. My ship lurched, not performing the way she should have but handling well enough to ease me into a far too wide and time-wasting parabola; already a Tar interceptor was dashing toward the fleet. My visual caught him: orange!

"Johnson! N72 come in!"

"Here, Smith."

I let out my breath.

"Damage report, N72, and keep turning while you send it."

"Sorry, Smith, half the thrusters out, cabin decompression, main engine dead; I don't quite believe I'm alive. Afraid half the stern's gone, Smith. Make do without me. My suit's intact."

I was nearly pointed back toward the fleet.

"Roger, Johnson. Sit tight and deploy your rescue beacon. You'll get back all right."

I didn't find out if he had locked onto the same ship I had attacked or onto the orange Tar. It didn't really matter, now.

"Battle Command! Fill me in."

"Will do, N70. One bogie still penetrating; N71, N73 attacking. N73 on standard firing run. N71

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is swinging in from the rear."

I nearly laughed. Richards, that clever devil! The Tar would have to dodge N73's barrage, and Richards would catch him when he did. A good, sound plan. I admired it despite myself.

Night Killer vibrated, but silently. Only then did I discover that the air had left my cabin. Thank God for the pressure suit! I checked further, to find four thrusters out of action, and worse, the firing connection to my port missiles cut. But that shouldn't matter. In no great hurry to get back, I slid the power down a notch and watched the stars slide by.

"Mayday!"

I froze.

"Mayday, HS *Jonas Salk!* Fifteen hits. Decompression. Main power out. Damage control inoperative. Officers unaccounted for. Mayday!"

I may have shouted; I may have gasped; I'll never know.

"ALL FIGHTERS. BOGIE PROCEEDING PLANETSIDE EIGHTEEN HUNDRED KILOMETERS PER HOUR. SCRAMBLE N80's. SCRAMBLE ALL N80's! *JONAS SALK* COME IN. REPORT *JONAS SALK!*"

A benumbed portion of my mind was calmly telling me that there would be no answer, that *Jonas Salk* would never speak again, while what was left flung me into a screaming parabola toward Lot as radar picked out a single, fleeing white dot against a sea of fluorescent blue and stamped it indelibly on my screens. Disregarding shipping, my speed stabbed up the scale.

"Butcher!"

A destroyer flashed a heated warning: Shipping Zone! I ignored it and swooped past, streaking toward Lot. *Night Killer*'s acceleration was on my side; the butcher ship drew nearer.

Two minutes from the *Salk's* report, I struck.

A single missile split off and raced ahead, clawing out for the orange speck. I cursed the broken firing connection, and remembered that left me eight missiles. There were none to waste.

The Satarii burned his thrusters and veered off on a new tangent, my first warhead exploding behind him. I followed, pleased he was running, diverted from making a straight plunge home. It was just a matter of time.

We were well beyond the invasion fleet now, heading out into open space. There was a brilliant flare ahead as he used his brakes; I matched him, wrenching my stomach and half blacking out but keeping on his tail. Our speed shuddered down toward three thousand, incredible strain, deadly speed. I closed still.

He slammed sideways and started spinning on his axis, even as his forward speed went unabated. I matched every move save one, plunging in to fire again, this time a two-rocket spread. He dodged it,

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sidestepping with sickening ease, and I saw red. I thought of Benjamin, the war hater, and of a butchering, orange Satarii who had torn apart the mercy ship. Injustice, irony, anger, hate! I cursed him, filling my ears with epithets.

Friend orange was cool, playing for keeps. He ran a series of tricky maneuvers and ended by darting back toward Lot. I sliced after him, locked on his tail, wrenched through a dozen, a hundred fantastic twists, still shouting, still cursing with every ounce of mindless thought. I flung two more missiles, shot forward, seeing red and knowing I'd missed and crying with rage at the knife-edged fact. And friend orange slowed, sidestepped, and latched himself onto my tail.

I was well and truly trapped. The thought took a moment to sink in, and then I flung *Night Killer* violently heavenward as explosions ripped where I had been. Sidestep, slam up, down, fast, slow, over, roll and up, over, nose around and scream for the stars! He followed every maneuver, flinging single missiles with awesome skill. And gradually, under the stress, I began to calm down. The red retreated from the edge of my vision, and I started to viciously stamp at my feelings. I was crawling with hate for a candied-orange, arrowhead fighter, but I had hated and nearly been killed. Now I would go cold as a frozen skull and rip him from the sky.

Over, under, thrust, roll! As I calmed, the maneuvers came out smoother, faster, with a more professional sheen. I was holding my own, but couldn't shake him. I needed aid. I needed assistance to take that Satarii bastard off my tail.

"God damn it, B.C.! Help!"

"Coming, Smith. N71's coming. Repeat, N71 is coming to aid."

Oh, Richards baby, so help me God, let me kill this devil and I'll kill the rest for you. Sidestep, up, accelerate, brake, but he matches me. Damn! You were right and I was wrong; you can't back a bastard who hits a hospital. Just take him off for a moment, Richards, and let me do the rest!

"N71," the Battle Command link was open, and snatches of conversation crackled through. "N71, put on some speed!"

It was Stephens' voice.

"By God and thunder, Richards, accelerate! Save Smith and I drop all charges!"

What was that? I looped up, braked to fall planetside. He followed, no closer but not letting go. This was tough. You had to hand it, plaudits and honor, to this orange flyboy who works like the devil, works like there's grapples hooked onto your stern. Battle Command broke on again.

"Clam it, Richards! What charges? You had that bastard nailed and you broke off, you damnable fool! You let him hit *Jonas Salk*, God damn you! What are you waiting for? Drive in there!"

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Roll and roll not thinking really; the orange bastard follows. I stared at the speaker, my active mind frozen, catching the words. Let him through! Richards? *And he's gonna tear you outta your tower, Smithy, you hear, Smithy, you hear! Whatever it takes to rip you down, you hear! And he let* Jonas Salk *get nailed, YOU HEAR!*

I heard.

The Tar didn't expect it. I braked my speed sharply and so did he, but then I locked myself directly in front of him and braked again. His missiles streaked by, and a scorched orange belly went soaring over my ship, jumping *Night Killer* to barely avoid a collision. He had no choice and I leaped after him, as fragments cut into *Night Killer*'s belly to wipe out any thrusters left below. I could do no more jumping, but he didn't know it, and I was onto his tail now.

He veered toward Lot, his turn to be desperate, and my last two missiles went off directly broadside. His engines cut out, were knifed out. The orange arrowhead speared on, but this time from inertia. His maneuver had not been carried through, and now he was sliding out into space. I followed him, triumphant.

Mist clouded and blurred the Satarii outlines momentarily as air fled the punctured hull. I put on a little more power, and drew up alongside the wreck.

The Tar was in shambles. I stared at the canopy. Half of it was gone. But what was left gave me a mirror image of my own ship, and that was shock enough.

Night Killer II was nearly severed. Between me and the rear engines was a gaping wound, filled with hanging scrap like the entrails of a sword-sliced dragon. How she had continued to function was beyond me.

I looked across at the Satarii's wreck and at the reflection of mine. Instantly hate, long pressurized, drained out to be lost in the vacuum. Admiration filled every inch of my mind, admiration and kinship. The third world, the transcending world. The master pilots, stripped to the very bones of experience. I thought then that Benj would never forgive me for killing this alien. For this alien, to his other-world eye, had literally done nothing wrong, and at the same time had done something fine and miraculous. How could I condemn this pilot for an act that our own side was guilty of, and an act that to him was not so much foul as commonplace? Were he a human, yes, then there could be doubt. But he was not a human; he did not see from human eyes or think from the vale of human misery, and that left more than a shade of difference.

Another ship drew up alongside my foe, on the other side. Black letters stood out on its gleaming white hide: N71. My suit radio crackled.

"Hey, Smithy, thanks for the Tar. Thanks for the God-damn bastard, Smithy!"

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I could see him beyond the orange scrap heap, grinning, his visor up. N71 was not depressurized. N71 was unscathed. It was unscathed because *Jonas Salk* was dead, and N71 had not made a move to save her.

"Hello, Richards," I said. Something in my voice must have hit him, for he didn't speak. We rode, silent, in a ragged formation, speed fourteen thousand kilometers per hour. Minutes dragged by as Lot shrank noticeably behind us. Richards coughed uncomfortably.

"Hey, Smithy, we better get back; we better get back! You all right, Smithy?"

"Go on back, Richards," I said, cold as the sweep of *Night Killer*'s hull. "All my thrusters are out. I haven't any control. But you can go back, Richards. Yeah, Richards, you better hurry. You might be late for dinner."

But my former wingman would not lose his conquest so easily. He had beaten me; he still needed time to grind it in.

"Hell, Smithy, if that's all, I'll tow you back."

I didn't answer. In his unscathed ship, Richards grinned and stuck his thumb in the air. He fired a belly thruster to step over the wreckage between us, but then burned a top one and stopped. I could see his face working, his decision being made. He put on more forward speed, crawled past the shattered Tar, then sidestepped neatly across its nose. He had a point to make, and he was sharp.

I averted my eyes from the gesture, feeling a dull ache of hatred wash over me that I didn't bother to fight. Thus I never saw the Tar launch his last missiles and lacerate Richards' hull.

I did see the results. A sudden flash blotted out the stars, and subsided. Fragments leapt past as I flung myself behind a bulkhead for protection. *Night Killer* jerked, but nothing penetrated. I raised myself again.

The sparkling hull that had been N71 was two-fifths gone and smeared a sooty black. It was pockmarked, like a miniature moon. Over my suit radio came a high, whining moan, the shriek of a steer in the slaughterhouse. It was a sound I had often heard before, but never from someone I knew. I turned the volume down, feeling nothing, and looked back across at the orange hulk.

The Satarii pilot was visible again. We looked at one another for long moments. Perhaps he was wondering what I would do. I had not told the full truth to Richards. I still had a few thrusters working and, miraculously, my main drive. And my hull, though fractured, was not fractured enough to let the Tar see that my port missiles had their firing connection cut. It would not take much, to his eyes, for me to fall just a little behind and end the game.

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"Oh God, Smithy," the voice, tinged with indescribable horror, whispered from my turned-down speaker. "Cabin air's gone and my suit's been punctured!"

"How badly?"

The response came automatically, the result of years of training. I told myself I didn't care, not for Richards, not ever again.

"Both legs, Smithy. I got em sealed off, but God!"

"Sorry to hear that, N71," I said. "You have your gun, of course."

Or I tried to say it. Somewhere between "have" and "gun," my voice ran out, the tongue of Buddha Smithy clove to his mouth. I hated Richards, God, how I hated Richards! But he was beside me still, and he was the tapir torn by piranhas, that heaves from the boiling water and the swirling surge of a million teeth to somehow make the trampled bank, shrilling its horror at the wreck of its body, knowing, not the red of hate, but the searing red of pain. And I was the jaguar, that finds there easy prey. And he was the man who fell among thieves, while I was the first priest, righteous as hell and knowing it, too, but somehow I couldn't pass by. No, not even now, though the man before me had killed my brother as surely as the Tar. Richards was powerless over me; I had passed so far beyond him that him I could pity, not fear. I suppose I had feared him, once. Feared that he would shake me from my monastic tower; feared that when tribulation came I wouldn't meet the test. But I feared him no longer. Richards the tempter, Richards the tester lay before me, and I had overcome him, here, in the star-strewn field of the gods. The words caught on my teeth, and by the time my throat was cleared to say them, I found there was no need.

"Richards," I said instead, "I'm on my way."

But there was one thing remaining before I went to him. I turned in my seat and looked at my alien companion, wondering what to do.

What should I do? No doubt if he had an ounce of engine power left, he would ram. But I was not a Satarii. I thought differently. I used different standards. When I returned to *Polar Star,* I would be going to Captain Stephens to get myself discharged. That much I owed to Benj. That much I owed to myself. But first there was something I owed to my foe, to the man in orange, that incomparable master of the air.

I stood up in my seat, gestured at the wreckage sprawled between us, and then, with that involuntary twist of the lips, that rare and fleeting smile so patently impossible to resist, I saluted. And across the savage place of battle, my enemy did the same. ■

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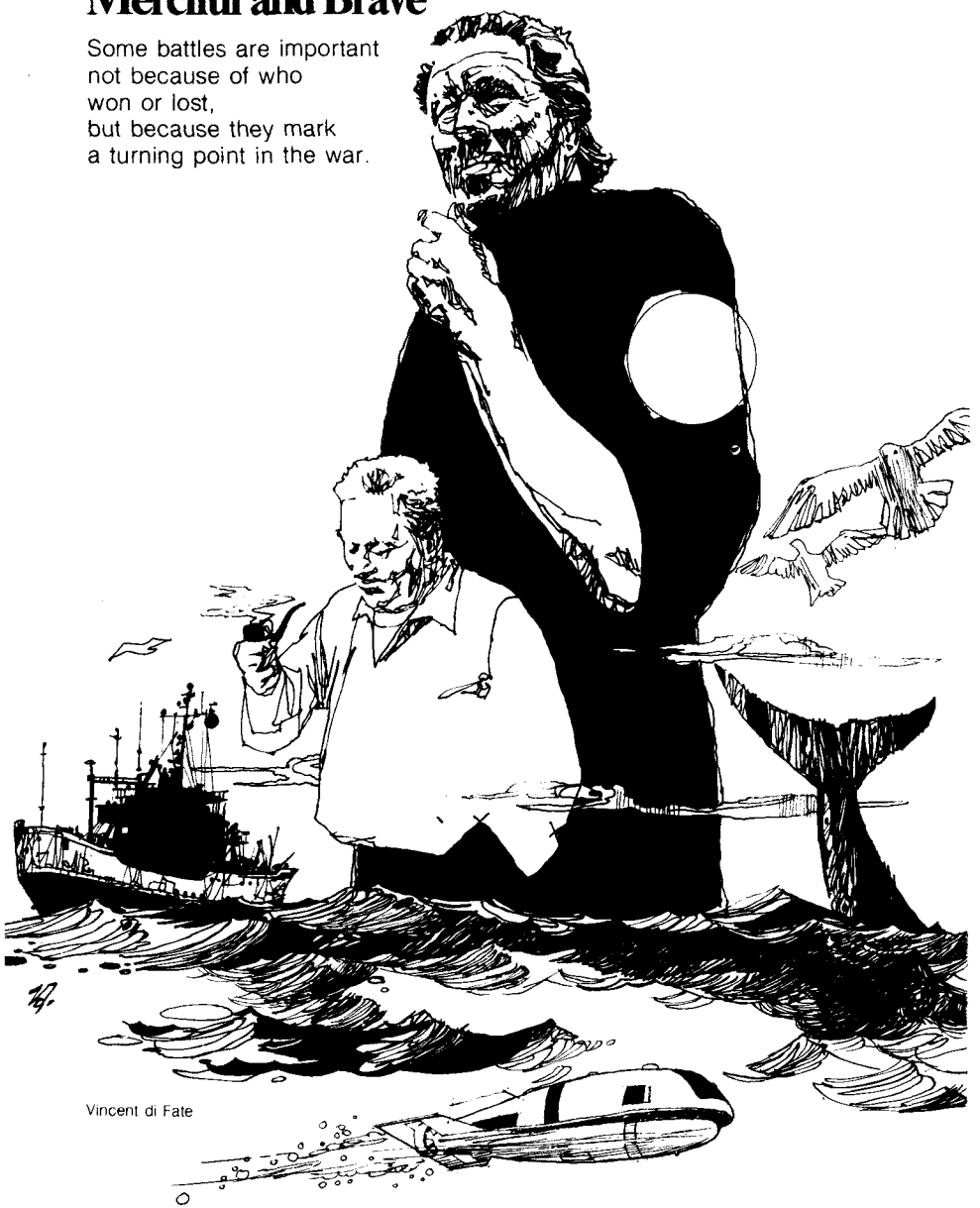
RICHARD OLIN

To Be a Champion, Merciful and Brave

Some battles are important
not because of who
won or lost,
but because they mark
a turning point in the war.



Vincent di Fate

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The six Pacific gray whales plowed through the mounting waves ahead of oceanographic research vessel *Nereid.* A force-four wind gusted to five, sending riffles from the storm front blowing out of the northwest. Radar, sonar, and loran—the electromagnetic antennae of the *Nereid*—kept the ship's officers and watch informed of the changing world around them.

Holt Broken Bull drew off a fresh cup of black coffee from the urn and, balancing nicely against the slight tilt and roll of the vessel, took a seat at one of the tables in the mess.

"What's the word on Sanford's project?" Clew Nordsen asked him before he'd finished spooning in his usual teaspoon of sugar.

Holt thought a moment. Shrugging, he said, "About the same. Underwater mikes are picking up too much noise from other sources to get a clear picture of what the whales are sending."

Clew stoked up his huge black briar, a curve-stem, and had surrounded them both with a halo of blue tobacco smoke before he nodded. "About what I thought." His big white teeth showed in a grin as he nodded again, adding, "Well, at least our friends up ahead are being well fed. I monitored the mike intake. Most of the noise on it is shrimp-clicks and noise from other small-fry. Must be upwelling around here."

Holt agreed. The strong, deep currents rising from the lower ocean brought with them rich minerals that were nutrients for the plankton near the surface. When upwelling occurred, the surface turned into a rich, soupy broth. Whale-feed.

The four cows and two males the *Nereid* followed were members of a rapidly vanishing species. Holt was glad to hear they were making it so well. He blew into his mug of coffee.

"I was sorry to hear about Chadsworth," Holt said on an altogether new topic. Tye Chadsworth was a highly qualified marine zoologist. He had not shipped on *Nereid* this trip. His research grant had been canceled.

"Same here." Clew acknowledged. He thumbed more shag into the pipe, relit it. "As usual, protection of threatened species comes bottommost in the federal barrel." The big Dane belched. The belch itself was sufficient comment. "Since the new administration started its austerity program, cutbacks have been falling thick and fast. It makes you wonder whose project will get the chopping-block treatment next."

Holt shook his head. "I don't know."

"Well, you're safe," Clew remarked with an ironic lift of his heavy blond eyebrows.

"Sure," Holt agreed sourly. "I can always go back to live on the reservation."

Clew snorted. "You know I didn't mean it like that! What I meant was we eggheads can get the ax any time. And it is damn seldom we are

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missed. But an expert electronics man, such as yourself, is too valuable. With your skills, you'll always find your abilities in demand."

"Thanks, Clew, I knew what you meant. I guess I'm in a bum mood today." He reached into the pocket of his blue work shirt and pulled out a letter. "Here. You might like to read it. My sister wrote it. It was in the mail the seaplane brought yesterday."

The Dane picked up the envelope, read the postmark. "Pinehat, where's that?"

"In Arizona. My people asked her to write me. They want me back. It seems the loggers and bulldozer men are causing a load of trouble up around Pinehat."

"What kind of trouble?"

"Just fights right now. We hope it doesn't get worse. The loggers are on our land. They aren't welcome, and they know it."

"Why not throw them off in that case?"

"Can't. Bureau of Indian Affairs says the umpty-umpth clause in our treaty gives away our forestry rights. The logging companies can take every stick of wood off the mountain if they want. It's legal. Or so the Bureau says."

Clew swore. He read the letter. Laying down the pages, he drew furious puffs from his pipe and began cursing again.

Holt smiled wryly. "Don't take it so hard. It's the same old story. 'For so long as the sun shines, the grass grows and the waters run,' et cetera, 'this land shall be the land of the Apache.' Or the Sioux, or the Paiute, or Comanche, or Cherokee, or whatever.

"But one day the sun doesn't shine. It's behind the clouds. And grass won't grow. It's been trampled flat. And that's what's happening at Pinehat. The water in the streams has to be boiled now. When I was a kid, you could drink it right from the stream. In another ten years or so, when they've destroyed the watershed, there won't be any water at all. So, one day, not even the waters run. And that's the day any Indian knows too damn well. He should. He's had days like it often enough before."

Clew Nordsen crashed one heavy fist down on the mess table. "Your people should fight!"

"We did. Remember? Besides, it's the wrong century for an Indian uprising."

"Then take it to court! You have rights—"

"Against who? The Federal Government? Minimum time for a suit that big to go through the courts is five years. It could last ten. By that time, the damage will be done and the loggers will be off doing the same thing somewhere else."

The Dane swore one last time. Then, angry and silent, he knocked loose the dottle from his pipe. With a gloomy expression, he methodically refilled it.

"As a matter of fact," Holt said, "I

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once thought of going to law school. Too tough. For me at least. Some of my cousins went. One made it. He's a practicing lawyer today."

Nordsen shook his head. "No. For you, it is obvious that electronics is the thing. You are good at it." He lit the black briar. His next words surprised Holt. Never before had he heard Nordsen apologize for anything.

"I am sorry I lost my temper," said the Dane. "I grow furious hearing about situations I cannot help make better. You and your people at home. Chadsworth's project—which was a good one. The whales. These things make me feel helpless. And because I do not like to feel helpless, I lost my temper."

Holt smiled. "It's all right, Clew. At least you aren't indifferent." He finished his coffee, held out his hand. "Got some work to do. See you on the next shift."

"Yes. When we take the samples." Nordsen brightened, gave Holt's hand a hard answering grip. "Do you think you will fly back to Arizona? If you tell the skipper, I am sure he'll give you an emergency leave. I will say a word to him about it, if you wish."

"Thanks. But I just don't know yet, Clew. Maybe I'll ask you to do that—when I've made up my mind."

"Don't worry. I know you. You'll make the right decision."

"I guess I will. As soon as I figure out what that right decision is."

Down on B-deck's bay, Holt worked on the monitor bombs that would be used tomorrow. The "bombs" were miracles of compact design. A little over a meter long, they were rugged enough to be dropped from the seaplane, sensitive enough to pick up or broadcast over a wide area. Ahead of the tubular power pack, nestled to either side of the racks of printed circuits, were sonic and thermal pickup units that registered and recorded the surrounding marine environment to a fine degree. Each unit was self-propelled and could navigate either from a preprogrammed group of course settings or steer itself in response to direct radio command.

Needless to say, the monitors were expensive. The research vessel took care to retrieve them as she ran across them in her day's haul.

There were thirty monitor bombs in the bay. Less than half that number would be used tomorrow. But Holt checked all of them. He buttoned the last access plate as Sanford entered the bay.

"Bad news," said the little wispy-haired oceanologist.

"Oh?" Holt tightened a final nut and straightened. "What's happening?"

"Sparks reports transmission from two sources. One is in Japanese. The other is Russian. Both ships are apparently in the area our whales cross the day after tomorrow."

"So why panic? Being Russian or Japanese doesn't necessarily make

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them whalers." Though Holt did not exactly like the news—he was aware, as were they all, that these two nations had consistently ignored the United Nations' repeated pleas to suspend their whaling activities before every cetacean on the globe was exterminated—he refused to get excited until he knew what was happening.

"They could be commercial freighters," he said.

"They could be. But I don't think so. Neither one of them is close to a shipping lane. Besides, Sparks' wife lives in Kyoto. He knows enough Japanese to understand part of what they're saying. He's positive at least one of them is a whaler."

"Maybe both are, then, and they are following a herd. Though God knows, there are few enough herds around. Think it will mean trouble for our friends?"

"I don't know," Sanford admitted. "But I don't mind telling you I'm worried."

There was nothing anyone aboard *Nereid* could do. At Holt's request, backed up by Sanford, the seaplane was asked to do a flyover inspection of the two vessels before it rendezvoused with *Nereid* in the morning.

It was a clear night, the storm having blown off to the east, and Holt took several hundred turns around the boat deck before turning in. Unsure of what prompted him, he asked the watch to call him at 0600 the next morning.

Holt was breakfasting on eggs when Clew banged his way into the mess. From the way the man stomped through the serving line, Holt knew he had heard the news. Nordsen set down his tray with a loud clang and took the seat opposite.

"Good morning," the big man grunted. Moodily he added, "Not that there is anything good about it."

"Sleep badly?"

"No. But I dreamed *Nereid* had fourteen-inch guns. We were hunting whaling ships. Bang. Bang. Simple as that." He stuffed a piece of toast, whole, into his mouth. Around it, he said, "I understand dreams are sometimes a form of wish fulfillment."

Holt did not reply until he had thoroughly studied the gray paint on the bulkheads. "We're well out into international waters," he said at last. "Do you want to start a war, Clew?"

"No. I want to end one! Man's been at war with himself, with other species and with nature since he first inhabited caves. He's too good at it. Much too good. If we win many more 'victories' over nature, all of us are going to have to pack up and find a new home."

Holt sopped up the last of his egg yolk with toast. "You know the word for eggs in Apache? It's *tashabeganabegesh*. The reason it's so long is that, loosely translated, it means, 'eggs that don't come from a turkey.' "

Clew looked startled. "Why that?"

"Simple. Before the white man

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came, the only eggs available were turkey eggs. Wild turkey lived up in the hills. *Tasha* means 'turkey' and the rest of it is the qualifier. 'Eggs not gotten from' or something close to that.

"An old chief I knew as a boy was called 'Tree-that-grows-tall.' It's really a simple, descriptive language. Chief Tree-that-grows-tall had a saying in Apache. Loosely translated, it said, 'There's lots of ways to outwit the U.S. Cavalry.' "

Frowning, Clew said, "I don't believe I follow that."

"Don't worry. You will."

Whistling, Holt got up from the table and went down to work in B-deck bay.

Sitting on a workbench in Sanford's lab, Holt listened to a series of grumps, whistles and squeals.

"Essentially, what we do is catalog," the little oceanologist told him. "We find a signal that occurs over and over again, and we try to match it to the animal's behavior. For example, this one is pretty well-known."

A high, yammering whistle broke over the speaker. "That's a mother calling in her calf. And this," he said, turning a knob, "is a calf's distress call." Even Holt's untrained ears could pick out the high pitch of terror behind the call.

"*That* one," the oceanologist said proudly, "will bring cows and even a bull to investigate for miles around." Engrossed in his subject, Sanford was smiling broadly.

"This one means, 'The food is good around here.' And now this is, 'I feel skittish, let's play.' Another could mean, 'I feel nervous; there's bad weather approaching.' But one or two signals have stumped us cold. The problem is we don't know how intelligent these creatures really are. For all we actually know, some of what we pick up could be a cetacean Socrates discoursing on philosophy."

Holt asked, "Do you have anything that means, 'I don't like it here—let's move on'?"

"Several. Here is a bull signaling his cows that the herd is going to change course."

Holt shook his head negatively. "Not what I had in mind. Do you have any more?"

Sanford had many more, and—after a particular taped signal played—Holt asked the oceanologist to re-record it on a length of tape. He took

Answers to quiz on page 157

METALLIC: #1, 2, 3, 5, 6, 7, 11, 14, 18
NONMETALLIC: #4, 8, 9, 10, 12, 13, 15, 16, 17

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the tape spool down to B-deck and cut it into lengths, which he then spliced and installed as endless loops in the underwater speaker units inside each monitor's nose cone.

After that, he set to work on the propellant systems and the programming for each monitor bomb.

The seaplane arrived within five minutes of its scheduled time, despite the detour to the north. Both ships were whaling vessels, the pilot reported, and—in addition—a herd of eight with several calves was in the east ahead of the advancing ships.

"We're taking all thirty sticks," Holt called down to the pilot as soon as the plane was in position and the bay's doors were open. He lowered the canvas cargo chute. As soon as it was attached he began sliding down the monitor bombs.

"There's a change in the drop pattern this morning," Holt told the pilot, climbing into the seat next to him. "Just take off. I'll show you where to go."

Twenty minutes later, the pilot said, "I hope you know what you are doing."

"I've never been more sure," Holt told him. He was wearing a wide grin.

When the last monitoring device had been dropped in the area ahead of the advancing whaling ships, Holt radioed back to *Nereid* and informed the bridge of the situation. He got the ship's captain after a pause, who coldly informed him he was wanted in the captain's quarters as soon as he was back aboard.

"Yes, sir," Holt replied. Thumbing off the mike, he said to the pilot, "You better stick around after we land. I have a hunch I might be flying back with you to the mainland."

The pilot merely shook his head.

Clew Nordsen caught up with him as he left the captain's cabin. "Holt, you crazy Indian! I just heard about it! What—"

"Come on," Holt said, "I'll tell you all about it while I pack."

"Pack?"

That's right. I'm suspended from all duties while the skipper refers the matter to the Institute. Since I can't do any useful work around here, I asked him for my emergency leave." He grinned cheerfully. "I'll probably get fired."

"But—!"

"Walk with me, and I'll explain it. I'm in a hurry. That seaplane isn't going to wait forever."

It took him ten minutes to clean out his quarters.

Accompanying him back on deck, the Dane pleaded, "Just tell me one thing. There're rumors going all over the ship. Is it true you lost us all thirty of the monitor bombs?"

"Nope. They're running underwater, set to broadcast every few minutes. They've got maximum fuel in their tanks, so they won't come up until they run out. And they can't be countermanded by radio control. I disconnected that part before the drop. Don't worry," he told the astounded Dane cheerily. "You'll get

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them all back. In about two days."

"Two *days*? But what are they doing?"

Holt grinned widely. "They are sending out the whale language version of: 'Run! Murder! Destruction! Everybody clear out! ' " He laughed. "And they are all set to run directly in front of those whalers! By the time they finish, there won't be a fluke or a spout within a hundred miles!"

Flabbergasted for a moment, Clew could do nothing but stand there. Then, the enormity of the idea struck the big Dane. He threw back his head and howled. At last, wiping the tears of laughter from his eyes, he clapped Holt on the shoulder.

"What a brilliant idea! If the Institute doesn't fire you, I'll see if the Danish government can't strike you a special medal. In fact, I'll see they give you a medal whether they fire you or not!" He sobered. "No, I'm serious. I'll do better than that. I'll write a detailed account of your method and suggest the Institute and every other oceanographic research center in the world copy it!"

"Thanks, Clew. I appreciate that. If you are ever out in Arizona, look me up."

"You think you will stay there, then?"

"Probably. Got things to do. You know, I wonder if you realize how much I got out of our shipboard philosophy discussions. One thing they made me realize is that the times change, and with them weapons, but the battle is always the same. There's always something a man can do. He just has to think of it.

"See you around."

The westering sun gleamed through the windows of the seaplane's cabin as it banked over the drop area. Holt had requested the pilot to fly there one last time. He saw the wakes of the unsuspecting whaling vessels far below. He could not see the invisible monitors that kept pace in front of them, running in a broad arrowhead below the surface. Every cetacean was swimming hard out of the area.

He was satisfied.

Continuing its wide circle, the plane climbed and then leveled off. The pilot said, "I'm heading for base now."

Holt nodded. He was deep in thought.

The times and the weapons changed. The fight, he knew now, would always be the same. Whether it was for a tribe's hunting rights, or the freedom of life to go unmolested at sea, it was no more than two faces of the same battle.

His people had always been warriors. Champions who were brave and audacious. Perhaps it was time to take up battle again. No "perhaps" at all. It *was* time.

He didn't realize he'd spoken some of these thoughts aloud until he glanced up and saw the pilot looking at him.

"What?" asked the pilot.

"Oh, never mind. Let's get on home." ■

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Jump

The "power suit" that allows a frail human being to lift tons of dead weight and leap moderate-sized buildings in a single bound has been a science-fiction dream for years . . . until now!

THOMAS EASTON

". . . here is how it works . . . a mass of pressure receptors . . . You push . . . the suit feels it, amplifies it, pushes with you to take the pressure off the receptors that gave the order to push.

"The suit has feedback which causes it to match *any* motion you make, exactly—but with great force.

"Controlled force . . . force controlled without your having to think about it. You jump, that heavy suit jumps, but higher than you can jump in your skin.

". . . *that* is the beauty of a powered suit: you don't have to think about it. You don't have to drive it, fly it, conn it, operate it; you just wear it and it takes orders directly from your muscles and does for you what your muscles are trying to do."*

Sound familiar? It should. Espe-

*R. A. Heinlein, *Starship Troopers*, pp. 82, 83, Berkley Medallion edition, 1968, copyright 1959 by R. A. Heinlein. Quoted by permission of G. P. Putnam's Sons.

rams from cams

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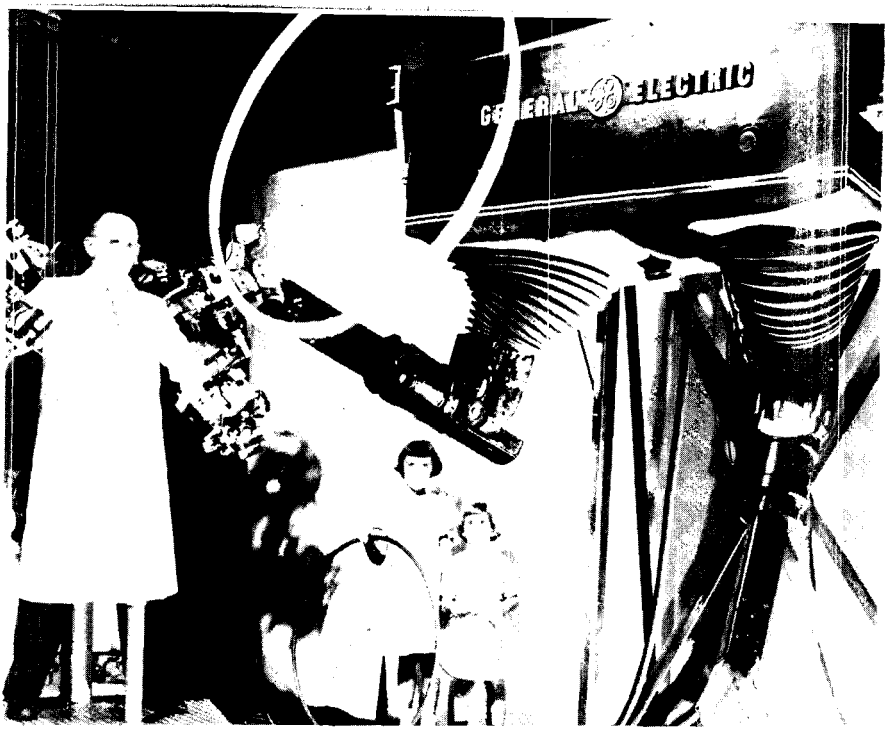

General Electric

Figure 1. Handyman—a two-armed master-slave manipulator used for handling radioactive equipment and materials. This photograph shows the operator in close proximity to the slave, which is whirling the hula-hoop. In actual operating conditions a concrete barrier separates the master station and the slave, their only connection being an electrical control.

cially to readers of science fiction. It's Heinlein's forecast—often followed by other writers—of a self-propelled, feedback-controlled, armored suit, such a thing as an infantryman needs when the exigencies of war require him to carry more than his back can hold and perform maneuvers his muscles cannot.

By the time of Heinlein's story, however, wars may not be fought by men in the field, with or without powered combat suits that follow their wearers' movements as closely as a suit of clothes. Even today the engineers are working on devices similar in principle to that suit, and their progress is such that by 1980 a man may well be able to step into such a machine. Furthermore, these same devices, together with certain developments in theoretical biology and information sciences, may be the forerunners of the first true robots, machines able to move about on legs with no more than occasional supervisory instructions from remote controllers. They may not have intelli-

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gence, but they will be autonomous in a way that no machine has ever been, for reflexes such as those found in cats and dogs may provide appropriate responses to many of the circumstances that may confront or befall them.

This article is intended to outline and motivate one possible path for the development of robots. The path is not inevitable, nor is it unique, but it seems to me a very likely possibility and—on the principle that the engineers could do worse than to imitate Mother Nature—very possibly the easiest way to build the first robots. More details on some of the information used here, and good discussions of some of the problems involved in designing intelligent and locomotor machines, may be found in M. L. Silbar's article, "In Quest of a Humanlike Robot" (Analog, November 1971), and in L. L. Sutro and W. L. Kilmer's article, "MR Robot" (Analog, May 1970). But hopefully, the data and arguments presented here will provide a general understanding of the possibilities.

Heinlein's suit is science fiction—but not quite. Modern technology hasn't yet produced anything quite like it, but it is coming close. Waldos—clumsy things with little or no real feedback—have been with us for years, but they are not suitably designed for incorporation into such a suit, much less into robots. There are more sophisticated, more recent approaches using feedback—not on the data from pressure receptors, for that kind of control data provides too many separate pieces of information for efficient processing and decision making by the cybernetic system of the unit—but on the data from receptors which measure changes in the angles of the joints of the operator's limbs. Such data are more useful because they are more immediately associated with a movement, they reflect its form more precisely, fewer receptors are required, and the response of the unit is nearly synchronous with intention.

Heinlein can be faulted only on the limits of his vision, for though he forecast the movement-following suit, he neglected to see the obvious and necessary corollary that allows the engineers to go him one better: not only are they designing machines very similar to his combat suit, but they are using in their design the concept of *force feedback* (FFB). Resistances, loads, and obstacles which may impinge on the mechanical effectors of their systems are sensed and returned to the operator so that he can *feel* what the machine is doing as if it were his own body. FFB amounts to an extension of the operator's kinesthetic senses (*not* touch) into the man-machine combination known to the engineers as the *C*ybernetic *A*nthropomorphous *M*achine (CAM).

Before going on, however, to show how CAMs may be turned into robots, we should briefly consider three such machines as illustrations of the CAM concept: Handyman, Hardi-

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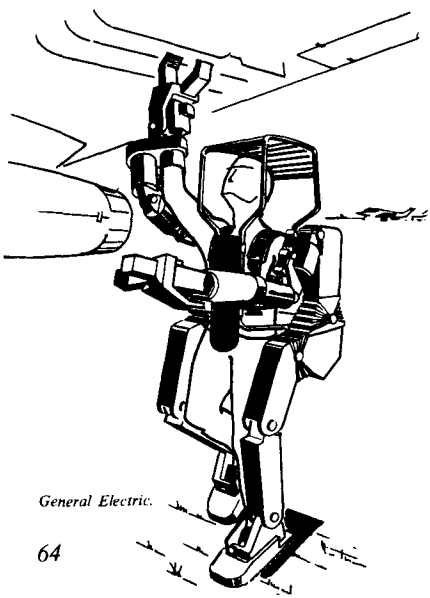
man, and the walking truck. They are not all at equal stages of development: Handyman is on the market, but the others have not yet reached the prototype stage. So far we don't have even a simple version of the combat suit available, but that, and more, is on the way.

Handyman, shown proving its dexterity in Figure 1, was designed for the handling of radioactive materials; only FFB brings it well out of the realm of mere waldos. The operator, on the left in the figure, wears a harness which measures the motions of each arm and transmits appropriate signals by cable to the servos of the manipulator on the right, while the forces encountered by the manipulator in its task are in turn measured and reflected to the operator via small servos in the harness as FFB. The coupling is so direct and detailed that the operator does not have to think about operating the machine. He simply concentrates on the manipulation task itself, observing the actions of the mechanical arms and hands as if they were his own, much like Heinlein's space trooper but with more accurate and stable control.

Figure 2. Hardiman—an exoskeletal manipulator to augment man's strength, made possible through human sensing control.



General Electric.

The closest approach of modern technology to Heinlein's conception is to be seen in General Electric's Hardiman, a walking manipulator that is attached to its operator like an exoskeleton (Figure 2). It is intended for use in bomb loading, underwater construction, and many tasks involving the handling of heavy materials. Hardiman is planned to have a load-handling capacity of 1500 pounds with FFB reducing the load felt by the operator to 60 pounds by insertion of a scaling factor into the feedback circuits. Such use of man's natural kinesthetic senses for fine control will make delicate tasks, such as picking up an egg or opening a door, much easier for the operator to perform. Without it, the muffling effect of the machinery and the extreme power available make it all too likely that the operator will apply too much force or apply it in the wrong direction, thus cracking the egg or ripping the door off its hinges.

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General Electric.

Figure 3. Left arm of Hardiman. During testing the operator successfully lifted the single arm's design load of 750 pounds. It performed well in the six major areas of concern—individual joint stability, joints-in-series stability, kinematic interactions, mechanical interferences, ability of the operator to control the system, and ease of operation—and "confirmed" the engineers' "confidence in the design and analysis of servo joints in series."

The same problems would necessarily apply to a robot: kinesthetic feedback is essential for the fine adjustments necessary to delicate tasks.

The various motions of the operator's limbs are measured by sensors attached to the joints of a light master skeleton fastened to him, and appropriate control signals are then applied to the 26 force-reflecting servos of the more massive and powered slave skeleton which does the actual work. Completion of the Hardiman prototype was planned for the spring of 1968, but by July 1970 only one arm, able to carry its own weight and lift its design load of 750 pounds (Figure 3), had been built and tested. This arm, however, did prove the usefulness of the design and show that GE's plans are realistic. Hardiman will be built and then only armor will be needed to provide the world with a near-equivalent of Heinlein's combat suit.

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The same kind of movement-following control is being considered for, and used in the design of, walking trucks, where the legs of the truck are the slave component and the operator may be supported in a harness that permits him to control the truck by "walking" on all fours. FFB permits the operator to feel irregularities in the ground and adjust the gait accordingly. Figure 4 shows the present conception of such trucks. They will be able to go where wheeled vehicles cannot and may be used in exploration, transport of goods and personnel to inaccessible locations, and, perhaps, as sophisticated prostheses for multiple amputees.

General Electric.

Figure 4. Artist's concept of the walking truck or quadruped. The front and rear legs of the machine will be controlled, respectively, by the arms and legs of the operator in movements similar to those of a cross-country skier. The proposed speed, payload, and dimensions are: approximately 5 miles per hour; 500 pounds; and 10 feet high, 12 feet long, and 3.5 feet wide.

What is a CAM? It is a combination of man and machine, the two interconnected by feedback in such a way that the operator needs no special skills other than those he needs to operate his own body. Particular tasks may require special skills, but operation of the machine does not: it follows the movements of the operator's body and his intentions and may be considered an extension of his body. Special sensors and special effectors, duplicating in function those of his body, let him reach, grasp, strain, lift, walk, run, and twirl hula-hoops as if he were naked to the wind.

Besides this, the mechanical portion of a CAM is mechanically perfect for use in robot design. It is a perfectly articulated skeleton, complete with "muscles," designed to permit very close imitations of human or animal movements—and the first true robot man builds will be designed to approximate man (or more likely a quadruped, for reasons of balance) very closely. The mechanism lacks only the control system provided by man in the CAM, a system of coordinated reflexes and decisions based on kinesthetic information, a system that provides a *coordinated* output, not a series of single, separate signals to each servo, but salvos of signals to specific groups of servos. In man, the corresponding groups of muscles are termed *synergies*; within one the ef-

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fects of a movement on the rest of the body are cancelled so that balance is not disturbed and muscles are recruited to aid those involved directly in a task. Might it not be possible to remove man from the CAM and replace him with circuitry able to generate the appropriate control signals?

Both Hardiman and the walking truck have effectively parallel master and slave skeletons, unlike Handyman, where they are separate though connected by cable. It is currently being considered that it might be possible to separate them completely, retaining only a radio link, so that the operator might wear the master skeleton in a safe and comfortable control center while the slave (or slaves) performs dangerous or difficult work under the sea, in orbit, or on other planets, wherever it might be cheaper, easier, or safer to send only machinery.

The advantages are obvious, but the drawbacks are the same as those attending any other use of remote control: in particular, wherever there is a time lag, progress in the task must be slow. For instance, a walking truck on the moon or Mars, if remotely controlled through every detail of its tasks, might stumble with one foot into a crevasse and before the operator could withdraw that foot and move away from the hazard, the machine could be at the bottom, damaged, trapped, or certainly restricted in its future usefulness. The only solution, given this mode of control, is to move so slowly that accidents cannot occur within the time lag.

On-the-spot control, however, is just fine. Responses are immediate and emergencies cannot develop unattended. All that is needed—given that we would rather send a machine to Mars than a man and that the machine is of the CAM kind, versatile, independent of terrain and task, easy to control—is some way of providing on-the-spot control, perhaps by making the machine autonomous in a sense, requiring only general supervisory instructions from the remote controller. *The whole point of this article is that this can be done.*

However, before trying to show *how* it can be done, one preliminary question must be answered: what will be the form of the first robot? It is, I think, fair to assume that the sole task of the first one will be locomotion, a well-defined problem of coordination whose solution will ease later attempts at building a more general robot.

Theoreticians have analyzed locomotion and concluded that only a quadrupedal machine can show "static" stability: that is, if while moving, the locomotor machine is stopped dead in its tracks, only a quadruped will not lose its balance and fall when it is moving in the transverse crawl and the slow transverse walk. Only in these two gaits is a polygon of support—a figure drawn

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with the vertices matching the feet on the ground and enclosing the vertical projection of the machine's center of gravity—continuously maintained.

Other gaits show "dynamic" stability: that is, a polygon of support is not continuously maintained, but the motion of the machine is such that before the machine can fall, a foot will contact the ground, the resultant thrust countering any disequilibrium. Since a bipedal machine must nearly always rely on dynamic stability, then for ease of control and the possibility of leaving the machine parked and waiting for use, the first such machine must have four or more legs. The walking truck is the most nearly available example of this and, because of its mechanical resemblance to quadrupedal mammals, a great deal may be learned about the control of the machine by studying the animal.

But given the form, how is the machine to be controlled? Continuous specification of limb or joint position won't do, for that would require too much computation and the machine would have little or no computer capacity remaining for other tasks, provided that it could carry a large enough computer for control at all. The best way may well be to copy the control methods found in nature. I don't mean that we must duplicate a nervous system such as may be found in a cat or dog, but that we could duplicate its function in a certain broad sense. Nor do I mean that a general purpose computer be "taught" to duplicate the function of a nervous system. I do mean that some of the structuro-functional relations of the parts of the central nervous system may be duplicated in the wiring of a robot so that the control methods are innate; just as a computer computes by adding one and one by reason of its wiring, this robot would control its movements in biological ways.

To determine these biological control methods, two immediately obvious aspects of locomotor behavior must be noticed: (1) volitional movements, which are smooth and labile in their expression, vary to fit the moment and its task, and adjust to correct for irregularities in the environmental conditions, and (2) the reflexes, which are stereotyped, stiff, and elicited only by particular kinesthetic and other stimuli.

A reflex (*not* a conditioned reflex) is a "wired-in" response, such as the familiar knee-jerk reflex, of one or more muscles to a particular stimulus. It is an innate relationship between effectors and sensors. Its form may be modified by such factors as location of the stimulus, what the animal is doing, and other reflexes.

Furthermore, the reflexes, when they are viewed all together and compared with volitional movement, seem to overlap it much as words do language. Reflexes are not volitional movements, just as words are not language, but volitional movements

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may be broken up into fragments that very closely resemble the reflexes, just as language may be broken into words. And it is a consequence of the "Theory of Tasks" currently being developed by Dr. Peter H. Greene of the University of Chicago Departments of Theoretical Biology and Information Sciences that reflexes are indeed the components from which may be built volitional movements. It should thus be possible to take the reflexes observable in nature, copy them in circuitry, install them in a CAM, and organize them into the movements which we wish a robot to be able to use.

A robot, or walking truck, equipped with such reflexes would not be the intelligent machine of science fiction; it would be instead a *R*eflex *A*utonomous *M*achine (a RAM) able—once instructed where, how fast, and when to move—to travel without being blocked or destroyed by the permanent features of the terrain on which it moves.

Unlike Disney's Audio-Animatronic dinosaurs and Lincolns, a RAM is not a pre-programmed machine or puppet; it is an adaptive machine, able to respond appropriately to some of the exigencies of its environment, equipped with biological reflexes which presumably allow it to operate effectively in all those environments that have contributed to the evolution of those reflexes, but unable to learn from experience—unless that were to be built into it. If, as seems likely, it is equipped with the perceptual and command systems studied by Sutro and Kilmer, it will become a true robot, verging on what one might take for intelligence and able to do much more than merely walk.

As described here, a RAM is a vehicle for transport or observation, but it need not remain so: Hardiman too is a skeleton and man too walks and works on a basis of reflexes. Hardiman too could be equipped with reflexes to let it walk alone and do more than walk, for hands will be necessary for many tasks, but a humanoid RAM will probably be preceded by a centauroid one, a Hardiman torso mounted on a walking truck and operating partly on a basis of invented reflexes to coordinate six limbs rather than the more usual four. The skeletons, or CAMS, are our givens and the control methods are attractive, but we have yet to combine them. If and when we do, robots—RAMs from CAMs—will join the tools man uses for work and exploration, freeing not only his life from danger but his mind and time from waste. ▪

Thomas Easton is a recent Ph.D. recipient from the University of Chicago, where he worked in the field of theoretical biology. He has published research papers in Brain Research *and* Experimental Neurology. *and has had a novel published by Greenleaf Classics.*

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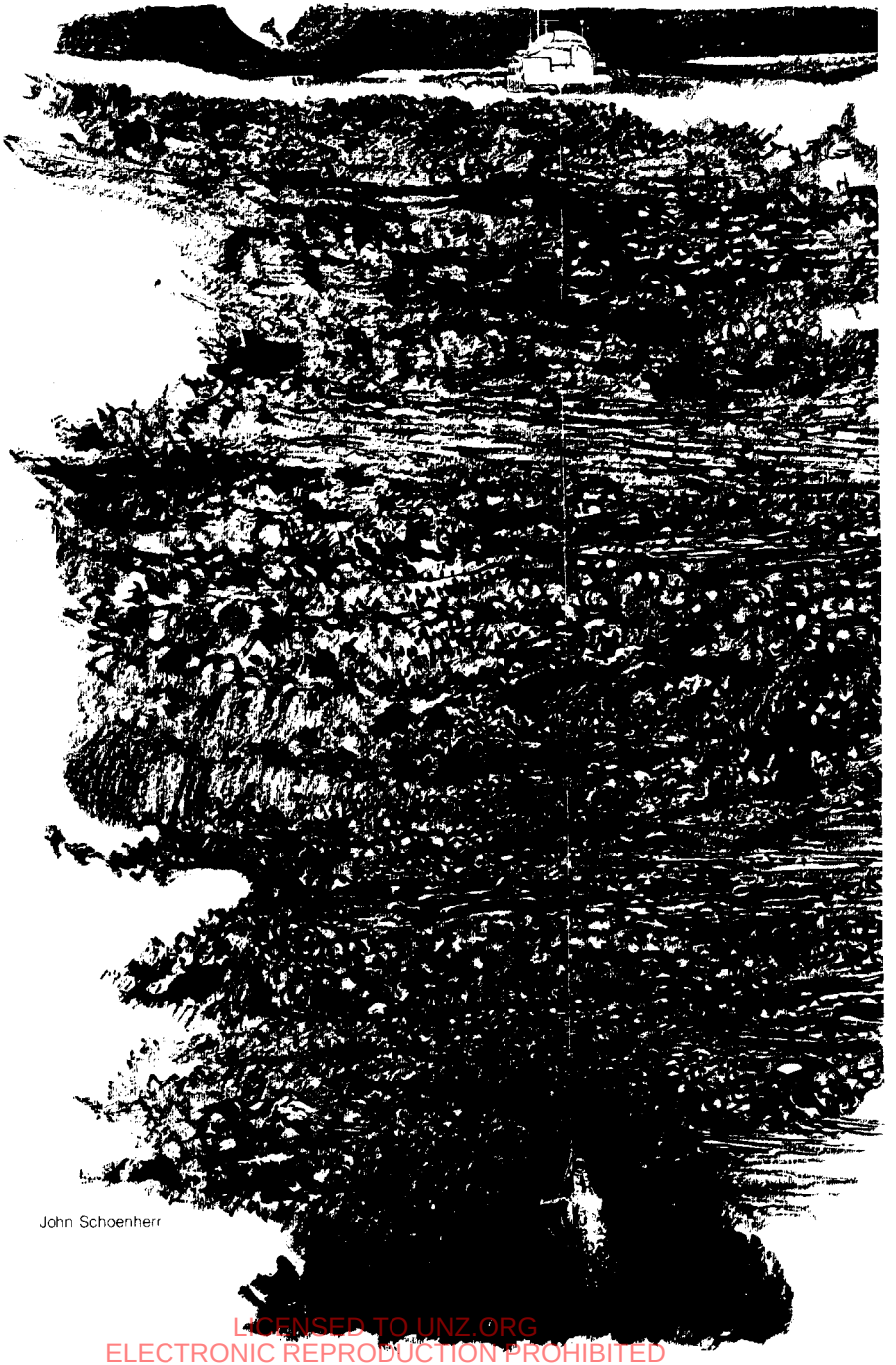

John Schoenherr

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BOB BUCKLEY

The Star Hole

There once were three princes of Serendip,
who went out on a search for . . .

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Laris Howard faced a problem. He was still breathing heavily from the climb, though for a colony-dweller he was in better shape than most. His advanced degree in lunar studies should have helped him throw off the feeling of unreality the view gave him, but it didn't.

"So, there it is." Howard spoke softly into his helmet mike as though he were revealing a fragile bit of artwork, a wisp of blown glass, or a sculpted ice dream floating just outside the celebrated zero-G studio port of Sky Station Six, not a black pit punched into the bleak lunar surface. There was a certain beauty in the scene it was true, but a hole, no matter how vast, is still a hole, and this one was dominated by the deceptively rounded hills rising about the jagged gap, tops glowing golden, runneled bases drenched in crepe shadows as sunrise swept over them.

"How many died?" Dr. Jackson asked finally.

"Six men and the cybernoid mounted in the crawler."

"Regulations?" Behind the blank gleam of the helmet glass Howard thought he could read anger in the old man's face, but he couldn't be sure in the dim light.

"Followed to the letter." Howard paused, staring down into the five-kilometer-wide pit and feeling the emptiness both inside and outside his suit. To his right Marian stirred, her voice putting words to his disorganized thoughts.

"A surprise," she murmured, "a lunar surprise that proved to be the final laugh for six young, reasonably intelligent men. Men who forgot that life is eighty percent predictable, and twenty percent pie in the face. They had driven far enough away from their blast site to suit the desk jockeys who make up regulations, but their last transmission was a routine ignition report, and when the rescue squad made it out to them all they found was this rather overdone cavity."

"But a twenty-kilo charge of plastic wouldn't have made a mess like this, even if the crawler's pile had been triggered off in some impossible way." Jackson knelt at the rim of the pit, sifting the brownish rubble of dust and rock through his gauntleted fingers.

Howard finished his scan of the jagged pit rim. "I'll bring up the crawler. It's obvious that we'll have to go down into that if we're going to find a cause. Marian, you come along."

"I'll try to find us a sheer drop to play the cable down," Jackson volunteered. Although the old man was the senior scientist of the party, and the foremost selenologist on the moon, he treated command routine casually. Marian and Howard both knew what needed to be done, and who could do a particular task best, without the ritual enforcement of a dominance hierarchy.

Howard grunted his agreement and shambled down the loosely packed talus slope that had once led

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up to the flat sweep of the Kinnerman Plateau. Marian stumbled after in his tracks, muttering.

"Space bogies," the young technician said suddenly.

Startled, Howard would have turned, but his momentum forced him on down the slope. "Would you explain that statement."

"A bogey is behind this. It was asleep in the rock, the charge woke it up when it blew, the thing broke free, and ate the crew."

"Along with five square kilometers of stone." Howard laughed, feeling the tenseness that had ridden with him out from the colony lift. With every report of strange death the fear—or perhaps it was a hope—would arise that now was the time man would come face to face with life that was alien. Yet every time the cause worked out to be something else. The bogey myth was a result of the predictability of the moon. The richly imaginative playground of dreamers had turned into a disgustingly commonplace ball of dead rock with as much mystery as a dried patty of cow dung.

"It's possible," Marian persisted. "What about the screaming cleft?"

Howard snorted. "A freak formation of stone with a pocket of ice beneath. Vacuum boils the ice, and the outgassing of vapor through the lips of the cleft resonates the surrounding stone like a giant trumpet. If Colony Two hadn't been built a kilometer away in the side of a mountain the effect would never have been noticed."

"But there was an extensive investigation, and two men had to be sent Earthside for psychiatric examination and treatment."

"Look, beautiful, you spend two months living by yourself in a twelve-by-twelve room where the walls moan like a dying ghost and see how healthy you stay. The cleft is interesting, but it's not evidence for something huge living within the moon."

"And the giant's footsteps?"

"You should ask Jackson about that one. He investigated, found that the booming vibrations heard around the Tycho Colony were centered in one area. There were several volcano cones nearby, all extinct, and also a large, hollow lava tube. He explored the tube and discovered a hot spot with another pocket of water, this time porous stone with a high water content. The water turned to steam every twenty seconds and jetted up a crack where it pushed against a slab of stone, causing one end to rise, and then thump back onto the floor of the tunnel. It was a short-term phenomenon, only about two years old when Jackson discovered it, and he doubts that it will last another year. If you had arrived at the colony a little sooner you would have been able to work with him as a myth-buster, instead of spending all your time creating myths."

"You're a grump," the girl com-

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plained sullenly, and finished the rest of the trip down to the crawler in silence.

Thinking that perhaps he had leaned on her too hard, Howard made the mistake of not keeping his mind on his footing and stumbled as he stepped down from the cluttered tumble of stone that made up the base of the slope. Marian reached out and caught him before he could hit the ground.

"You're safe," the girl said sweetly, giving him a pat on the bulky backpack.

"Thanks." Howard spun the hatch release, and stepped into the low stern air lock of the crawler. They had left the vehicle evacuated of air on their departure, and he walked quickly through the open inner door, down the narrow aisle to the driver's seat, and sat down before the broad bow ports. Marian shut the hatch and squeezed into the seat next to him.

"Why don't you want to believe there's life here?" she asked as she buckled a restraining strap across the lap of her suit.

Howard sighed, snapping over the switch that started the pumps and sent a surge of water through the pile tubes. He waited for the "boil" light to flash.

"It's not a question of what I want to believe, just a simple understanding of the evidence gathered on the moon. This is a world of stone. If something moves it's the result of mass wasting, outgassing, volcanic extrusion, fault slippage, or meteorite bombardment. Stone acting on stone. Nowhere does anything as complex as a living interaction exist, except for occasional germ infestations from Earth. I don't like it, but I accept it as the way things are, and if life *were* to be discovered I would be the first to turn handsprings, space suit or no."

"Well, you don't sound that way when you constantly put me down for using my imagination," Marian pouted.

"Imagination comes in all grades—realistic, and farfetched."

"Oh? You think my ideas are farfetched, do you?"

Within the confining privacy of his helmet, Howard smiled. Then the green light telling him that he had steam pressure up in the crawler turbine flashed, so he engaged the drive lever, and swung the machine about on one slewing tread. As its nose bounced up onto the verge of the slope, he accelerated. The treads, hardened webs of steel and tough plastic, slipped on the boulders for a second, then dug in and found the purchase necessary to force the crawler's heavy mass forward. Howard did not attempt to climb straight up the slope, but steered a winding course that looped back and forth in broad hairpins.

"There's Jackson waving at us over to the left," Marian commented.

"I see him. He must have found us a place to lower the cage."

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Howard accelerated slightly, then slowed as the crawler's blunt nose dipped down and over the crest of the slope. Marian squeaked as the forward ports went black and the pit suddenly yawned open-mouthed beneath them. Howard cursed, threw the drive lever into reverse. The crawler clawed wildly at the edge for a second, then slid back to a safe balance on the pit rim. Sweat beaded Howard's brow as he reached over and fired off anchor bolts, rods of carbide steel slammed down from beneath the crawler into the stone to serve as braces. Then he triggered the arms that brought the wire-encased cage platform down from its perch on the crawler's cab.

"I'll go down first to scout out conditions. You and Jackson stay up here to pull me out in case of trouble."

"Playing the hero today?" Marian asked sarcastically.

Ignoring the gibe, Howard pulled a portable lamp from its clamp near the seat, and left the crawler. He found Jackson pulling the dangling cage over to the pit rim and starting to climb inside as he rounded the crawler's side.

"That's my job, I just called it," he said, and knelt to look down. He clicked on the lamp and let the invisible beam play below. The disk of reddish light flicked along the sheer face of the pit wall picking out tiny ledges, and gleams from embedded crystals. "Good visibility but I can't see the bottom."

"It's a deep hole," Jackson said simply. "Hyginus is a scratch in comparison. The crack that the Russians have been so puzzled over on the far side might be as deep, but whatever created this has to be a different mechanism."

"Odd. It has to be a cave-in, then?"

"If this pit had been formed by an explosion we would see debris scattered everywhere, but as you can tell at a glance, there just isn't any. Just this bloody great hole where a tableland used to exist."

"Space bogies." Marian skipped from around the rear of the crawler and tossed a small camera to Howard. "Take a picture of one before it eats you, O.K.?"

Howard bowed stiffly in his suit, then climbed into the swaying cage. "For you, love, I'll even get his autograph." He stowed the camera in a tray fastened to the cage railing, then reached up and examined the cable mounting on the overhead brace. Everything was secure.

"All right, lower me away, Jackson. And take the bogeylady with you."

"Right." The two figures, lumpy and grotesque in the protecting suits, disappeared behind the curve of the crawler, and suddenly Howard felt a surge of loneliness sweep over him. It was a common lunar malady. The barren wastes, the complete lack of anything soft and living, were a drain on natural well-being. Sudden quakes and meteorites were deadly,

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but they could be seen. Loneliness was an intangible thing that ate at a man until he fell to pieces, gnawed away from within.

"Here you go." Jackson's voice blaring across the radio circuit caused Howard to start with surprise. The cage jerked as the cable began to play out of the crawler's reel, then began a smooth descent. The rim of the pit rose above Howard's head as he turned to play the light on the rock face next to the cage. Before him was a ready textbook in lunar geology. Heavily stratified, the layering spoke of meteor strikes, and alternate lava flows. The gray, pebbled gravel denoting meteor rubble was thin, sometimes a mere thread weaving across the pit face, but the lava flows were thicker. They grew in size as the cage descended until at last there was only a blank, black sheen of basalt to return the glow of the lamp. A check below still found no bottom. The light seemed to vanish into a gigantic maw.

Howard swung the lamp up just in time to see the rock wall that the cage had been following down suddenly swoop inward and become a ceiling. He played the light across it and discovered it to be a broad dome of rock ending where the pit began. As the cage fell away from this feature the darkness grew, and soon there were only two points of illumination remaining: the lamp glow, and the crest of a single mountaintop bathed in the sun's glow across the expanse of the pit. The cage swung pendulum-like as more and more cable was fed to it, but still Howard could not pick out the bottom. Marian's voice boomed into his helmet, touched with worry.

"We're nearly out of cable, Laris. How much more will you need?"

Howard glanced down over the cage railing and strained his eyes into the dark that was broken not at all by the beam of the lamp. "Too much," he whispered, finding himself fascinated by the intangible nothingness beneath him, and the colors blossoming before his blinded eyes in geometric patterns. "Pull me back up. We'll have to try something else."

The cage slowed in its descent, stopped, and began to rise. Around Howard the dark pressed in like a living creature, snuffling and squeezing itself close about his suit.

"Talk to me, Marian," Howard croaked. "Say something."

"What's wrong?"

"The black shapes . . ." Howard felt panic tightening in his throat, blocking the scream that wanted to race past his lips. He babbled wildly, his thoughts racing back to every childhood fantasy he remembered about things that waited where you could not see them. Mercifully, in the next moment the lamp beam splashed onto rock. The pit face had suddenly swooped back into place next to the cage. It saved his failing sanity, this familiar thing to focus his eyes on. The lamp light was blinding after the darkness; it burned his

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eyes, but he stared hypnotized until the cage bumped once more against the edge of the pit, and he saw Marian running toward him.

"So, you want me to let you go back down." Chairman Clifford was a tall man, very thin, and tending toward baldness. He was the founder of Colony Five, a tiny collection of dusty pressure domes scattered below a protecting fold of the Rim Hills of the Orientale Basin, and still served as its chief administrator. MacNeal O'Brien, Clifford's assistant whom he had brought with him from Earth, was the second person in the office. He was sitting quietly behind his desk reading Howard's report on the pit, while Clifford strolled about the tiny room in front of the closed port, hands clasped behind his back.

"Yes sir." Howard tried to swivel his neck about as he sat in the hard chair mounted exactly before Clifford's desk so as to keep his eyes on the administrator, but found the task impossible for anyone who was not a contortionist.

"Why?" The administrator's face was unsmiling, probing in its patient stare.

"Because of the tremendous opportunity we have now to learn about the deep layering of the moon, and the Orientale Basin itself. Dr. Jackson and I feel compelled to continue our studies in the area."

Clifford's eyes seemed to squint. "I think you're forgetting the state you were in when your teammates delivered you back at the colony. Total collapse is what the medic labeled it."

Howard shrugged, outwardly calm, but struggling inside to find an argument that would thaw Clifford's known antagonism to any project that diverted funds away from the expansion of the colony.

"I was unprepared for the conditions I found and was unable to adjust. Now that we know what it's like down there, we can compensate. Let me have the use of a jitterbug; it's noon, and I can install enough lights on the bottom of the bug to shame a small sun."

"A very small sun," O'Brien muttered, looking up from the report for the first time since Howard had entered the room. "I fail to understand just what an exploration of this pit will mean to us back here in the colony. I say avoid the pit completely. We know it to be a hazard, that's enough."

"But sir, the pit is unbelievable, it may even have a potential as a new colony site. Possibly we could roof it over. Can you imagine the size of the city we could put beneath it?"

Clifford laughed. "That would be quite a roof. More than five kilometers across, a considerable amount of surface area to expose to the possibility of a meteorite strike." The administrator stepped back to his desk and sat down, steepling his long fingers before his face, and peering at

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the tips for a moment in thought. Howard squirmed. He could see his dream teetering on the edge of the waste chute. Finally, just as Howard was expecting, Clifford shook his long head from side to side and made a low noise of regret.

"I'm sorry, Howard, but I just have to say no. Your plan to explore the pit is praiseworthy—I'm proud to have a man of your type on my staff—but you're just not up to the strain such an expedition would entail, and I'll just have to refuse your request. The colony cannot afford to lose three of its members for the length of time you say it would take to make an exploration. I'm sorry."

"And the men who died down there?"

"They have the grandest tomb that any man, Earth- or moon-dwelling, has ever possessed. I propose we put a memorial on the rim and make the pit a monument to their memory."

"I concur," O'Brien stretched expansively, tossing the report into the OUT tray of his desk. "For now I suggest you take Miss Crenner and yourself up to the central plateau of the Orientale Basin and continue with the present series of core drillings. This can wait a day or so while you take a short vacation, but Houston still pays handsomely for every pound of lunar material we send back to them, and we need every credit we can lay our hands on to keep this colony expanding."

"But Chairman . . ." Howard stopped, realizing that further pleas were futile. Clifford only wanted to see his colony bloated into a carbon copy of Copernicus City, and O'Brien was a hothouse. A domeworm who never walked the dust plains except for an occasional crawler ride. "Very well," Howard agreed weakly.

"Good," Clifford was suddenly jovial. "I'll begin making arrangements for the marker. You and Dr. Jackson will undoubtedly want to attend the ceremony so I will keep you in mind."

"Undoubtedly," Howard echoed flatly, and left. Ten paces down the deserted passageway a dark shadow detached itself from a strut alcove and hugged his arm tightly. He jumped, then relaxed when he saw who it was.

"What did they say?" Marian breathed. She continued to hug his arm as they slowly walked along.

"What I should have expected they would say if I had been born with any sense. Clifford thinks we should put a marker on the rim and leave the pit alone. O'Brien agrees, but that's nothing new."

Howard paused by a large canopy-shielded port. Outside the dome a crawler with a forklift attachment affixed to its prow was unloading a supply rocket from the Tycho Research Center. "You know, I'm tempted to go ahead and send a prelim report out to Tycho just to see what one of their scientists thinks about the pit."

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"What about our team?" Marian asked quietly.

"We're supposed to return to the Orientale Basin and continue our core drillings."

"Together?"

"Together."

"Well, then the situation isn't a total loss." The girl gave Howard a squeeze and waited expectantly. Any other time he would have responded with the ardor appropriate to the situation. This time, however, the warmth of the girl's cheek, and the musky perfume of her hair served only as a brief distraction to his thoughts, and blocked curiosity. Howard pulled away from the embrace and pounded the port frame with both hands. "It's useless to take piddling little fifty-foot cores out of a basalt dome when we could be examining a cut that goes down as far as the pit does. I feel like a surgeon wanting to take out an appendix and being limited to acupuncture."

"Didn't I hear O'Brien give you the day off tomorrow?"

"Yes." Briefly Howard wondered just how Marian had found that out so quickly.

"Well, Dr. Jackson knows somebody that might be able to check us out a jitterbug with the equipment we need. I remember his apartment's in "C" sector so let's go drop in on him, then go round up the good doctor. If we can find something odd in the pit we might be able to force Clifford to let us investigate, whether he likes it or not."

"And if we don't?" Howard asked dryly.

The girl shrugged, smirking. "So who will know where we went on your day off?"

Brilliant sunlight sparkled off the speeding bit of metal as it flew low over the jumbled confusion of the Rim Hills. Brief explosions of light glanced off the rounded canopy, the circular viewing ports, and the four spindly, spring-jointed legs, as the jitterbug swooped low over the contorted wound in the lunar surface that was the pit. Rocket engines flared at the end of the bug's strut booms, forcing the bug into a new heading. It yawed over the crest of the pit lip and began to descend, sliding toward the center in a precise search pattern.

Now there was no blackness ensnared in the pit, the sun hung overhead at blazing noon, and this time Laris Howard was feeling no horror in the descent. He calmly studied the palely glowing fuel gauges, and the banked scanner screens that showed him a panoramic view of what lay about and below the bug. Marian Crenner and Jackson were close by, scanning the landscape below with high-powered binoculars. Jackson made the first sighting of the pit floor, far below the dizzy climb of the sheer walls. As might be expected, the floor was a jumbled mess of broken stone. Flat slabs of rock were battered and up-ended, with sharp spears of stone protruding like

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knives between the blocks. Heaped everywhere in vast piles were tremendous mounds of rock dust looking like rancid mountains of whipped cream.

"There's the missing crawler," Marian suddenly shouted. "It's about fifty meters to our left, nose buried, the stern pushed up into the air almost vertical."

"Is there room for me to put the bug down?" Howard asked quickly.

"No, and don't try," Jackson ordered. "I'll tie a cable to the lock door and slide down while you keep the bug aloft."

The old man tugged his helmet on, looped a coil of thin cable over his suit shoulder and pushed into the bug's tiny air lock. Marian checked his seals, then clamped the inner door shut.

"Shouldn't someone go down with him?" she asked. "What if he should tear his suit?"

"He'll patch it. He knows what he's going to find down there."

Marian wiped at the condensation clouding the port nearest her and peered down. "I'm surprised the crawler isn't buried. It must have ridden the collapse down like an elevator. How horrible."

Howard nodded, concentrating on keeping the bug low, and over the wrecked crawler. Dust rose in tattered streamers from the tumbled rock, almost obscuring the view on the bug's belly scanner.

"I'm down," Jackson reported on the radio. "The hatch is loose, sprung open. I'm going to crawl inside."

Howard moved the bug, trying to see better, but there was a fog over the site. Aside from Jackson's heavy breathing they could hear nothing but occasional thuds as his suit bumped against obstructions. The dust churning below became thicker. Minutes passed, then the bug swayed as the trailing line was tugged.

"I'm coming up," Jackson said dully. After a long pause they heard him banging about inside the lock, then the hatch opened and he walked slowly out into the cabin, helmetless. He placed a shiny metal globe about the size of a basketball into an empty cabinet and shut the lid on it.

"The cybernoid from the crawler," he explained. "It seems intact so I salvaged it. The colony can't afford to throw functional colloid brains away." He flopped into a seat and sighed.

"What about the men?" Marian asked, then looked away as Jackson frowned uncomfortably.

Howard took the bug away from the wreck and headed for the cliff where he had made his first thwarted attempt at descent. In his looping circumnavigation of the pit he had discovered no other signs of caves like that which he had found then. Perhaps this area had all been a continuation of that one cave. The ceiling had grown weak and when the surveying crew had set off their blast the shock had precipitated the cave-

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in. He mentioned this to Jackson.

"Yes, you're probably right. Steinholt, the old porcupine, made a rather rash prediction that the Orientale Basin would prove out to be a homogeneous mound of basalt; just a lake of congealed lava." Jackson paused to glance out the port. "But from the looks of this pit I would say no, although before this all the evidence seemed to point that way."

"Might we find a piece of the asteroid that smashed here?" Marian asked hopefully.

The old man shrugged. "Doubt it. The strike was a trailing one, meaning the asteroid, or comet, caught up to the moon in its orbit, and probably looped it once before making its dramatic landing. But even so the major portion of the object must have been vaporized, along with about three hundred miles of lunar surface."

"It doesn't have to be very much," Marian continued. "Just a few fragments would satisfy me; I'm not hard to please."

"You probably wouldn't see any difference in the fragments, or the lunar material, my dear. After that shock everything must have looked about the same . . . nice and molten."

"There's the overhang," Howard reported from up front. Before the slowly moving bug the sheer wall of the pit face had curved back into a huge, black pocket. The sun's angle was such that the cavity was dark with shadow. Howard snapped on the lights he had had installed beneath the bug and a reddish glow illuminated the gloom.

At the sight Marian gasped, and Jackson got up from his seat and pushed forward into the bow of the bug to better see out the ports.

The cavity was almost a perfect circle, and within its concave expanse were numerous tunnels, all strangely regular in spacing. The largest was at the center, and about this were four rows of smaller openings. Altogether there must have been about two hundred of the openings, ranging in size from just a meter, to fifty meters across.

The lower tunnels were hidden beneath a wave of rubble that had swept in from the floor of the pit and filled the cavity almost up to the level of the largest tunnel in the center. There was an uneasy brooding aura lingering about the cave. Marian shuddered, and almost protested as Howard chose a large, flat block of basalt near the back of the cave and set the bug down on it in a vast billow of disturbed dust.

"Bring the core drill." Jackson, spry for his eighty years, jumped off the block of stone into the deep dust heaped beyond. Marian seemed to have forgotten her unease and was wandering about a nearby tunnel mouth, cautiously shining her light into the cavernous opening. Howard crawled from the bug's air lock with the core drill and squatted for a moment watching her.

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"Find any bogies?" he called finally over the radio.

At the sound of his voice the girl jumped. Howard laughed, then jumped down from the lock porch onto the block of basalt.

"Oh, be quiet and come over here, Laris. This is the strangest sort of stone I've ever seen. It must be a kind of basalt, but I can't identify it. Look how the surface sparkles under the lamp light."

"It's a form of glass," Jackson commented, dislodging a large fragment from the tunnel lip with his specimen hammer. "Not very like the kinds of volcanic glass I've seen before, though. It's hard, and quite strong, with a certain resilience that most glasses lack."

Howard climbed down from the block and loped over to the others with the unwieldy mass of the core drill slung across one shoulder. He glanced at the fragment of glass Jackson held in his gauntlet, then at the cave wall itself.

"Not much point in trying to make a core of this stuff. It would just wear out the bit."

"Yes," Jackson agreed. "But bring the gear along just in case we should find a use for it later."

Grumbling silently, and reminding himself whose idea it was to spend this rare day off from work in this manner, Howard rebalanced the drill on his shoulder and plodded after his two companions as they entered the tunnel and proceeded along it for several meters.

Its walls were smooth, with a curious dimpled effect patterning the rock. In some places the tunnel had been broken, and splinters and chunks of the glassy material littered the tunnel floor. Marian carefully picked up the best of these lumps and dutifully stowed them away in labeled sacks. It wasn't long before the canvas bag she wore over her shoulder next to her backpack was bulging with samples.

"Save a little room for what we might find in the other tunnels," Howard suggested, but quickly found that his advice was not appreciated.

"Don't be such a grump," the girl retorted sharply, and continued her halting stroll. Suddenly her lamp picked out a large lump of the glass that had fallen out of its position in the ceiling. She played the light up into the concave pocket left by the fall, and they could see a fine network of cracks in the material, some oozing a thin white mist.

"Ice buried up there," Jackson said. "And there must have been a considerable shock on the surface to have caused that lump to break off, too." He looked at the lump of glass in their path. "Think we can find a way around that without cutting our suits up?"

Howard pushed up beside Marian and maneuvered her light around. There was a narrow gap between one side of the lump and the tunnel wall that they might be able to traverse if they were careful.

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"There," Howard pointed. "But my suggestion is to go back and look through another tunnel. The large one, for instance."

"Grump," was Marian's only comment as she shouldered past him, eased her suit through the narrow gap, and continued on into the tunnel. The beam of her light danced wanderingly along the ceiling, then dipped and played along the tunnel floor. Smiling at her stubborn ways, Howard followed, helping Jackson along in back of him.

Suddenly Marian cried out. They hurried on and found her bending over an object lying on the floor, pinned in the glow of her lamp. Under the glow the object glistened.

"Ice," was Jackson's comment as he bent and prodded at the bit of translucent material with a gauntleted fingertip.

Howard found himself disagreeing with the statement. "If that were ice it would have boiled away in the vacuum." He glanced up at the tunnel ceiling. In the reflected glow from Marian's lamp the glass was smooth, unbroken. "There should be an ice spear hanging up there, also."

"It might have evaporated," Jackson suggested, playing the devil's advocate.

"And this wouldn't have?"

"It's bigger."

"I don't think it's ice at all," Marian said sharply. "It looks like carved crystal."

"And that implies a carver, a hobby I doubt interests space bogies." Howard opened a specimen bag and pushed the bit of unknown material into the slit. He sealed the airtight clip and made a brief notation on the ident tag before thrusting the bag back into his holding sack.

"One space bogey, bagged and labeled," he quipped. "We'll give it to Nakamura when we get back and call it our jackpot."

"I think not," Jackson said slowly. He had been staring down the yet-unexplored length of the tunnel. "What's that?"

Marian swung up the lamp and its reddish beam bounced back at them, blinding and distorted.

"Aim it down," Howard yelled, grabbing at his eyes, still sore from the earlier trip into the pit. He crawled forward, trying to see what had made the reflection, and suddenly the imaginary beast was back. Howard could feel it gnawing at the edges of his courage, invenoming his head with nameless fears.

As he crept down the tunnel the lamp glow showed him the blockage. It appeared to be a whitish translucent material like the object they had just found. It looked like ice, yet reason told Howard that this was impossible. Any ice should have boiled off long ago, in fact it should be boiling now, spitting off vaporous fragments of itself as it expanded into the vacuum. Howard peered at the surface of the "ice." It was pebbled, and thin lines weaved themselves across the surface making it look like

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a jigsaw puzzle. As he sat quietly studying the material Marian and Jackson pushed up, one on each side of his body.

"I thought I told you to wait," Howard hissed.

"We did wait," Marian giggled. "For a while anyway. Still think there's no such thing as a bogey?"

"This ain't no bogey," Jackson muttered. The older scientist took the lamp away from Marian and held it close to the surface of the blockage. "Only about ten centimeters thick, and it does look like crystal."

"Watch it!"

As one, the three lunged backwards as a portion of the translucent wall puffed into mist. Gradually, like a chemical reaction that having once started cannot stop, only slow, the wall separated into globs of mist that seemed to retain a coherent shape apart from the others. It was impossible, but it was happening.

"I don't like this. . ." Howard began.

"They're moving off!" Marian shrieked.

The wisps, having made some collective decision, shot past the suited humans and vanished down the tunnel behind the fallen stone.

"Was it the heat, or light that made them move?" Jackson wondered out loud.

"Are they alive?" Marian asked, her voice tightening.

"They obviously react to stimuli, that's one definition of a living creature." Howard stood and gazed up the tunnel. "I'd like to find some more in their solid state."

"No, let's go back to the bug." Marian looked wistfully back the way they had come. "I think it's time we explored another tunnel."

"I have to support Howard on the decision to go forward." Jackson took the lamp away from Marian and strode ahead determinedly into the unexplored section of the tunnel. The others had no choice but to follow.

For thirty meters they saw nothing but the blank, rippled surface of the tunnel walls. Then the lamp glow illuminated something in the distance. The shape became brighter and larger, then divided as two tightly knit, gossamer clouds flashed past them without stopping, and disappeared into the darkness behind them.

"Reinforcements," Howard said dryly. "And here's some more of our little friends up on the ceiling. Shine the light up there, Jackson, while I try to collect one."

Carefully, Jackson eased the light beam upwards so it wouldn't startle whatever sense the creatures possessed, as Howard removed another specimen bag from his sack. Both creatures were solid, about the size of two hands pressed tightly together, and beneath their hard rinds was a colorful interplay of veins slowly twisting and coiling among themselves like dying snakes. Fasci-

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nated, Marian seemed to forget her fears and pressed her helmet close, then jerked it away as the nearest creature exploded into mist and flashed up the tunnel.

"Watch it," Howard grunted. "These things could be dangerous."

"I'm sure they are." Jackson reached up and prodded with his gauntlet at the tunnel wall where the creature had been resting. Bits of glass cascaded down as the material crumbled away like rusty metal. "Try to put the other in the bag, Howard."

Whatever the creature was, and whatever it used for senses, it was sensitized to touch, for as soon as the lip of the plastic bag touched its surface it exploded and flew away leaving only a discolored area where it had rested.

"Tentative characteristic number two: they can learn and pass information between themselves," Jackson enumerated. "We had best be cautious from now on."

Just as this was stated and agreed to five of the wisps appeared floating steadily toward them from the unexplored end of the tunnel.

"A reception committee?" Howard took a step backwards. "Just how do you express peaceful intentions to a blob of gas, Jackson?"

The old scientist thought furiously for a few seconds and found himself at a loss. "Stand perfectly still is my only suggestion. Perhaps they can only sense moving objects."

"These are larger than the others," Marian whispered. "They remind me of soldier ants. We disturbed the doorkeepers, and a pair of workers, and now the soldiers are coming to repel invaders."

Jackson sighed. "I sincerely hope you are wrong, young lady."

They stood quietly in the darkened tunnel, the lamp beam probing out like a blind, immobile eye to splash against the left wall, and watched the five faintly luminous wisps of gas zip curiously about in front of them. Howard fought to remain calm as one of the wisps hung stubbornly in front of his helmet plate and seemingly stared into his eyes. The churning, curdled mass hanging before him did not have any eyes that he could identify, but still the wisp hung and waited.

Suddenly Howard heard a noise. Jackson had jerked involuntarily as one of the wisps had dived on him, and then wheeled away. The others were quick to react as soon as they noticed the movement.

"They're all over the front of my suit," the old man cried. "They solidify and secrete an acid foam as soon as they touch the suit fabric."

Howard grabbed the lamp away from Jackson and dropped the drill as an encumbrance. Awkwardly he prodded at the clinging alien lumps with the hot lens but found the ploy useful only as a temporary measure. As soon as one creature had been dislodged, another would dart in to take its place.

"Fall back along the tunnel.

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We've got to try for the shelter of the bug," Howard shouted finally in frustration.

Now they ran with the wisps flitting viciously about their helmets. Time after time a darting cloud would swoop, attach itself to a suit and solidify, forcing the other two humans who were still free to stop and force the creature off. It was a slow, halting dash they made and as they pressed past the blocking stone that lay across the tunnel Howard discovered another impediment. The wisps that had flown past them had joined the first group that had constructed the translucent door with their bodies. Now there was another door in their path. One slightly stronger than the last.

There was no time to be subtle. Howard ignored the large wisp that was single-mindedly trying to attach itself to his shoulder, and ran full at the gleaming disk of creatures. His helmet struck first, tearing a hole in the "ice" as he stumbled and fell forward on his faceplate. The rest of the disk vanished under the trauma of the shock and suddenly the tunnel was packed with whirling wisps of gas. Jackson and Marian stooped, picked up Howard's stunned form, and ran with him between them like a sack of dunnage. They had nearly covered the rest of the distance to the bug before realizing that the pursuit had stopped. They lowered Howard to the ground and leaned panting against the walls of the tunnel.

"I've got so many leaks in my suit I whistle when I walk," Jackson complained between gulps of air. "Let's start patching each other."

"Deal," Marian agreed, and began pulling sealing kits out of her belt pouches. Jackson had six large, broad depressions eaten into the suit's plastic coating, but only two had gone so far as to allow the escape of air. Howard's suit was worse off with three deep holes, while Marian had only one. As she worked on Howard's suit she began to laugh.

"What's wrong with you, beautiful?"

"Oh, I was just thinking how silly you're going to look turning handsprings all the way back to the bug. Remember what you said earlier?"

The colony lab was not a large one even though it took up a whole dome, but it was efficient, and thorough. The chief reason for this was its director, Itio Nakamura, and at this moment the stocky Japanese-American was staring with undisguised fascination at the delicately coiling blob of mist moving frantically from one end of a large sealed tank to the other, batting its flailing

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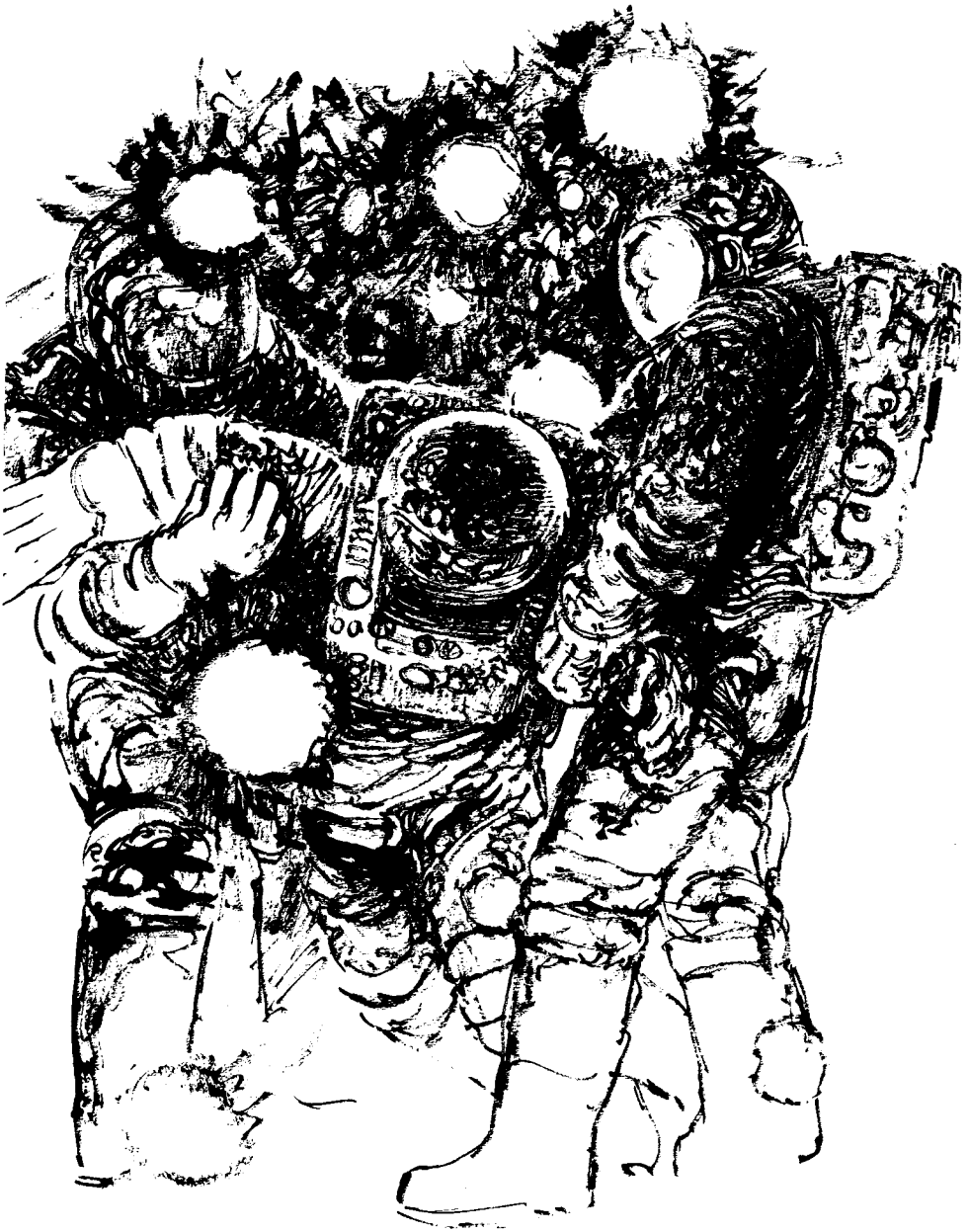

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wisps of diaphanous arms against the glass like a trapped butterfly.

"It's beautiful, completely and utterly beautiful," the little scientist breathed. "When I first put it into the tank I thought you were making a joke with me. A lump of crystal flying, indeed."

Howard laughed. "Can you tell me what it is? You've been playing with it all morning."

Nakamura shook his head sadly. "Not yet, but the information my tests have extracted has been fed into the cable shunt for Tycho Research Center. Their large computer should be able to tell us something. Possibly explain why a mobile gas can exist in a vacuum, and why it has such a strong magnetic field."

Howard grimaced slightly. "Have you heard anything about Marian or Jackson through the whisper vine?"

"About what?" Nakamura stared blankly at Howard, who shrugged.

"I'm not sure. They were told to report to Clifford's office at the start of the work day, and I was curious as to why. Especially since I received this 'report or else' slip at lunch today. Seems the ol' man heard about our trip."

"He's probably going to pin a medal on you." Nakamura scratched his thick hair happily, then turned to study his cherished beastie again.

"There's something strange about this critter, Laris. I get this nagging thought in the back of my head that I should be remembering something about basic biology."

"Too simple," Howard muttered. "The wisps are too refined."

"Exactly," Nakamura agreed. "Nature is not so perfect, or streamlined. I would almost say this animal was designed from what I have seen of it so far. Did you know it has a third life state?

"No, what?" Howard glanced at his watch and saw it was almost time for his meeting with Clifford.

"Liquid. I left the lab for a few minutes, and when I returned I found the bottom of the tank covered with a thin film of water and the wisp gone. I was just about to open the tank when all of a sudden the juice balls up into a lump, and there was the creature again, looking like a solid. It's puzzling because I can't think of any survival value such a mechanism would have for the creature."

"Marian said its behavior reminded her of colony insects, ants or termites."

"Yes, I remember her saying that yesterday. And Jackson said that they ate rock. That seems impossible."

"Maybe they eat each other."

"Not possible. You're talking about a perpetual motion machine and there's no such thing."

Howard shrugged and stood. "Well, whatever it is you're going to have to tell me later." He started to walk out of the room, but paused at the door for a second. "You might do me a favor, Itio. Pull a miracle out of your test tubes. I have a sink-

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ing feeling that I just might need one very badly in the next couple of minutes."

"Sit down, Howard."

Remembering that it hadn't been so long ago that he had heard those words before, Howard sat. Clifford's office was crowded this time. Jackson and Marian Crenner were standing at the rear of the room, silent and tensely erect. Marian was flushed, and she had given him a weak smile when he entered. O'Brien was there, too. He was sitting behind his desk with his feet up, methodically cleaning his fingernails with a nail file with the air of a high priest officiating at a human sacrifice. Behind O'Brien stood Clifford. He had opened the port at the rear of the room and was staring out the thick glass at the alternate valleys and hills that marched across the basin like frozen waves.

Howard waited. A long interval passed without anyone saying anything. Clifford loved the dramatic-impact approach to employee discipline and used it frequently.

"You disobeyed my orders, Howard," came the first low-key dart. A testing shot deployed to lure out a too-early defense. Howard let it go and studied the back of his left hand where the pressure of suit gauntlets had formed a thick place on the skin. Clifford still had not turned around and O'Brien was concentrating on his manicure.

"Why," now Clifford turned, his eyes narrowed, "in the face of my direct order, did you still go out to the pit?"

Howard glanced up, but said nothing. It was not yet time. Clifford wanted to wind himself up into a frenzy, like a revival deacon thundering out a crusading diatribe in which Howard would be so firmly nailed to the bulkhead wall that there would be no possibility of his escaping.

"I told you quite plainly not to continue with the exploration of the pit, yet you went right ahead and did just what you pleased."

Howard shifted his weight in the chair. "What I did I accomplished on my own time." He did not bring Marian or Jackson into the reasoning; Clifford just might decide to begin chewing on them again. "I did what I felt the circumstances warranted."

"What you felt was warranted," Clifford repeated coldly. "This is my colony, Howard. Do you really think you know more about what is beneficial for it than I?"

"I was only—"

Clifford cut off Howard's reply. "You are not more important than this colony, Howard. And the practice of science is not an adventurer's game of dash and dig. Science is based on the slow, tedious accumulation of facts."

"It's hardly scientific to ignore significant data . . ." Howard tried to say, but was cut off again. Clifford was feeling his wind now, and he

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surged ahead oblivious to any interruption.

"Someday we will understand this basin, but it will not be because of a misfit's desire to pursue adventure. It will be because of solid, commonplace, painstaking lab work." Clifford droned on and on, pounding home his obvious point until Howard began to wonder how he still saw anything to pound on at all. O'Brien finished with his cuticles, and started over again, finished them, and started over on them for a third time when Clifford finally ran down. "And you are going to be dismissed from this colony and be sent back to Earth with a reprimand in your record, Dr. Howard."

"No!" This brought Marian out of her corner into the center of the room. She clung to the back of Howard's chair and boldly stared Clifford in the eyes. "That just isn't fair after what we've discovered."

"Discovered? Bah! You people trot out on an unauthorized jaunt and come back with some inane excuse about discovering moon wisps." Clifford slammed the top of his desk with his hand. "Gas leaks, that's what you discovered. You brought back a bag of swamp gas, and if it were not for Dr. Jackson's fame as a selenologist, and your value to this colony, Miss Crenner, as a woman and a technologist, I'd have you both accompanying Howard on his trip back to the flatlands."

"No!" Now Jackson stepped forward with an angry gleam in his eyes. "Chairman Clifford, I cannot agree with your conception of our discovery. We have found something unprecedented, and it's insane to label it a hoax just because it doesn't fit in with the commonly accepted knowledge built up about the moon."

"There is *no* life on the moon," Clifford bellowed. "The first Apollo flights proved that conclusively. There is absolutely no reason to believe otherwise. No one even bothers to look anymore."

"The reason is down in Nakamura's lab," Jackson exploded.

"There is nothing living in that tank, Dr. Jackson," Clifford said with cold emphasis. "Only a wisp of gas that is behaving strangely because of low temperature, and the vacuum."

"The temperature in that tank is seventy-two degrees, Clifford. And the vacuum is only partial, the rest being inert gas," Howard growled from his chair.

"Please gentlemen." O'Brien finally raised his eyes from his fingernails and blessed the others with his gaze. "Let's show the proper respect to the Chairman's position. I haven't seen this so-called 'moon life', but I'm sure we can dispense with it as being some kind of mistake. No charges are being filed against you, Dr. Jackson, or you, Miss Crenner, so you may both depart. Only Dr. Howard is being chastised, and justly so, I might add."

"You little wart." Before Howard

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could grab her, Marian stomped over to O'Brien and presented him with a ringing slap to the ears. The administrator went glassy-eyed for a moment, then jumped up to stand near Clifford.

Silence wrapped the room like a cloak. Marian stepped back to grasp Howard, shocked at what she had just done. Clifford sputtered a little, then the door bounced open and Nakamura entered, a cablegram in one hand. He passed it to Clifford, and as he turned away gave Howard a sly wink. Clifford scanned the message, his eyes widening. He glared at Nakamura, then Howard. Then back down at the message.

"Is this a joke?" His gaze was back on Nakamura.

"No sir. That's just the way it came over."

"This is crazy," Clifford said sharply. "Completely crazy. Just when did you discover a spaceship, Howard?"

"A spaceship, sir?" Howard was forced to stare blankly.

"That's what this gram states. The Tycho computer reported that your glass samples fit no known chemical pattern. It says they were part of a synthetic artifact, and hypothesizes an alien spacecraft." Clifford stared at the message in his hands as if it were something unclean.

"You are ordered, Howard, to join Dr. Jackson, and seven assistants to be chosen by need, and set up a temporary dome at the pit site. You will serve as a technical crew for Tycho as the investigation has been ordered by Commander DiPaoli himself."

Howard shifted uneasily in his chair, wanting to smile, but unsure that it was safe to. Clifford passed the paper to O'Brien, who was still rubbing his face.

"You were lucky this time, Howard. In view of these orders I will drop all charges."

"Thank you, sir."

"Now get out of here, all of you." Clifford turned back to the port and pointedly ignored everyone until the room had emptied.

In the hall Howard gave Nakamura a resounding slap on his back. "You pulled off a miracle after all, didn't you?"

The technician laughed. "I'd say *you* did. How do I get on your staff, Jackson?"

Marian grabbed the old man's arm and snuggled it. "Don't forget me," she cooed.

Jackson smiled broadly. "I'm forgetting no one. If Clifford will release you to me you both can become pit-crawlers. But I warn you, I will work you until you begin to think of Clifford as an angel."

The first week of the new project saw the construction of the dome on the floor of the pit, and lights being installed about the work area. Darkness had returned to the pit with the lowering of the sun, although night had not yet fallen on the lunar surface, and the workers lurched through the valleys and tubes of the

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site, their shadows leaping hugely upon the walls. Several crews of men began taking corings of the inner rim of the cave-in, building up a map of what had once been below the rock ceiling.

Jackson, Howard, and Nakamura remained close to the ship, exploring the network of tunnels, and making behavior studies of the wisps. Time passed slowly, but soon all the area was draped in night, and the work-lights seemed a fragile island under the enormity of the stars and dark.

Nakamura was the one that made the heartbreaking discovery that the wisps were slowly eating the ship away. Comparing his data with that of the core crews, he found that the entire pit had once been filled with the ship's hull; but millions of years of wisp activity had reduced this huge structure to fine dust, and a very short segment of what might have been the ship's stern. That was all that was left intact.

Howard and Jackson concentrated their studies on the wisps themselves. They analyzed their structure, confined them in tanks, and made them display their whole bag of tricks. The results were interesting, but also disappointing.

The first discovery was that they were not entirely gaseous when in wisp form. As the body changed from a solid the reaction used energy in such a manner that the core of super-cooled material was formed. How this managed to maintain itself was still a mystery, but about this core the gas was held tightly in a magnetic bond and manipulated.

The disappointment was the lack of intelligence showed by all forms of the wisps. Both solid and gaseous forms showed only reflex behaviors. The liquid form had a slight ability to learn, but this was limited. Jackson placed the wisps somewhere near social insects on the intelligence scale.

A strange item was that the wisps reproduced in the liquid form. If the liquid wisp was presented with an ample food supply for at least thirty hours, it would divide. Jackson decided to augment their number of the creatures and so started a "farm" for the wisps which consisted of many sealed tanks in the dome itself. Howard appointed himself keeper and made regular runs to provide food. It was on such a run that he made the discovery of the entire project. He paused to wipe the water mist off one of the rear tanks before siphoning some food into the sealed tank and discovered a large shadowy shape inside where there should have been none.

"Marian, come here."

Howard called the girl over hurriedly, partially as a witness, and partially as support.

"Look in that tank and tell me what you see."

Marian peered for a second, and shrugged.

"Five liquid wisps, and a curved slab of glass."

"Did you put it in there?"

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"Of course not. I'm working with the core sections."

"Well, I certainly didn't." Howard held up a bucket filled with glass dust that steamed slightly in the warm, moist air of the dome. "This is all I ever give the critters . . . makes for easier ingestion, and faster growth. Now, where did they get that slab?"

Marian looked inside the tank again. As they watched, the wisps moved like reluctant amoebas over the sharp edges of the glass slab, and as the creatures moved they left behind them a visible ridge.

"They're reconstructing the glass hull," Marian cried suddenly. "They're rearranging the material, not eating it."

"How? Where are they getting the energy to remain alive?"

Howard dropped the bucket and glanced about the cluttered work area. As he did, his eyes fell upon the coldly glowing U-V lamp the crew used as a health precaution. Someone had left the lamp positioned next to the wisp tank, and the bulb was aimed directly into it. "That's it," Howard shouted. "I understand now. Remember that apparatus that had corroded away in the upper reaches of some of the tunnels? I recognize it now. These things aren't pets, or aliens, or anything else that we've been thinking of."

"Well, what are they?" Marian demanded impatiently.

"Get me another U-V lamp so I can test my theory and I'll tell you. Meanwhile, I'm going to find Jackson. He's going to want to know."

Ten hours later Chairman Clifford received an odd request from the pit station as he sat before his wide desk. It was signed by Jackson, but the wording was all Howard; he recognized the eager intensity.

"That idiot," Clifford grumbled out loud after he had read the message. O'Brien from his seat across the room heard the mutter and raised his eyebrows questioningly.

"What's wrong?"

"It's that nut Howard, again. He wants us to send him thirty 40-watt U-V lamps, a portable power supply, fifty tons of obsidian glass, and a steel launch rack."

O'Brien laughed. "Why?"

"The idiot says he's going to build a spaceship." ■

THE ANALYTICAL LABORATORY/JULY 1972

PLACE	TITLE	AUTHOR	POINTS
1	The Mercenary	*Jerry Pournelle*	1.53
2.	Collision Course	*S. Kye Boult*	2.43
3.	Count Down	*Laurence M. Janifer*	3.61
4.	Unfair Trade	*Patrick Welch*	4.00
5.	Monster in the Waterhole	*Glenn L. Gillette*	4.18
6.	Man Off a White Horse	*Howard L. Myers*	4.87

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The Vietnam War Centennial Celebration

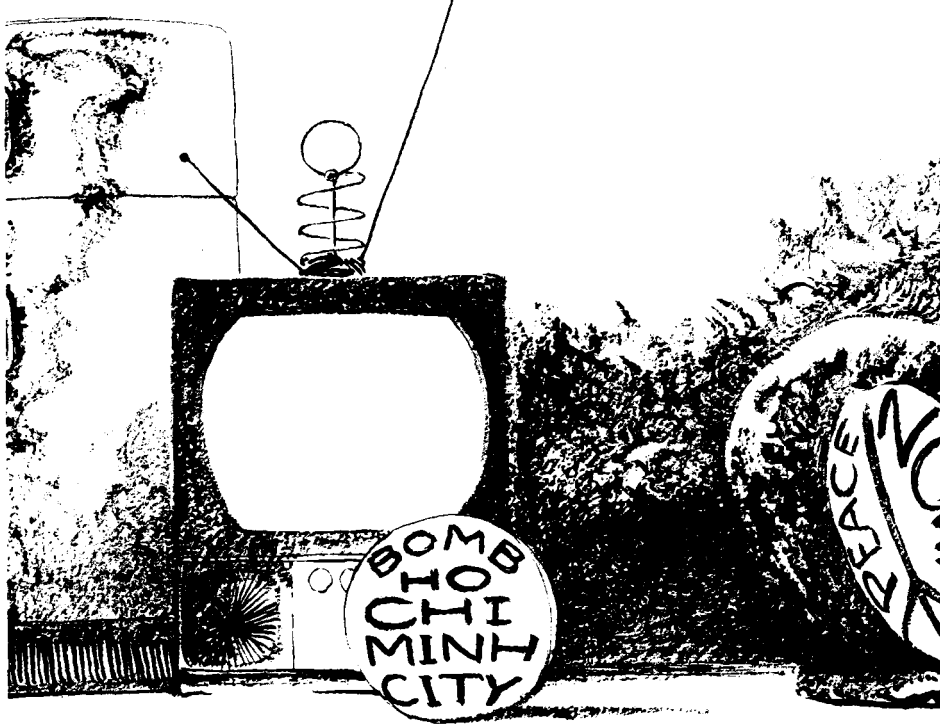
Distance lends enchantment—and a historian sees things very differently from the people who made history.

RALPH E. HAMIL

The following documents are excerpted from the appendix of *History of The Vietnam War Centennial Commission (2057-2077)* by Uhuru Stuyvesant Chang (Sansan: Ecumenopolitan Press, 2081).

Chang, after several years' unrewarded efforts to find a publisher, finally secured sufficient myriabucks to propagate his book himself. It enjoyed only modest sales in the United States but became a best-seller in Great China and Australasia and was later translated into Sovangliski, Spanglish, Franglais, and Deutschlisch.

Chang held that the Vietnam War Centennial Commission, though



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ridiculed by contemporaries, served to reinforce the psychic barriers against a revival of the institution of warfare. "By memorializing the inglorious, indecisive Vietnam War," he commented, "we are clamping another nail into Moloch's coffin."

Chang was killed during the early days of the Optiman Rebellion of 2088.

DOCUMENT NUMBER 1

Public Law 134-49 (April 7, 2055)

Joint Resolution

To establish a commission to commemorate the one hundredth anniversary of the Vietnam War, and for other purposes.

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Whereas the years 2057-2077 will mark the centennial of the Vietnam War, a supreme experience in our history as a nation; and

Whereas the sacrifice of our people in that great ordeal was severe in all sections of the land; and

Whereas the Vietnam War occasioned a severe internal crisis which, nonetheless, strengthened the national and world desire for permanent peace; and

Whereas the sons of Asia and America have subsequently helped construct what hopefully will prove to be such a peace; and

Whereas it is incumbent upon us as a nation to provide for the proper observances of the centennial years of this great event: Therefore be it

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) in order to provide for appropriate, coordinated, worldwide and nationwide observances, there is hereby established a commission to be known as the Vietnam War Centennial Commission, hereafter in this Act referred to as the "Commission," which shall be composed of members as follows:

(1) The President of the United States, President of the Senate, Speaker of the House of Representatives, and Secretary of State, who shall be *ex officio* members of the Commission;

(2) Three Members of the Senate to be appointed by the President of the Senate;

(3) Three Members of the House of Representatives to be appointed by the Speaker of the House of Representatives;

(4) Five Members to be appointed by the President of the United States, two of whom shall be from the Department of State and two others of whom shall be from the Department of Defense;

(5) With the approval of the Secretary General of the United Nations, two Members from the Washington Division of the World Library.

The President of the United States shall call the first meeting for the purpose of electing a Chairman. The Commission, at its discretion, may appoint honorary members, and may establish an Advisory Council to assist it in its work.

It shall be the duty of the Commission to prepare an overall program to include specific plans for commemorating the one hundredth anniversary of the Vietnam War. In preparing its plans and programs, the Commission shall give due consideration to any similar and related plans advanced by international, transnational, national, megalopolitan, state, civic, patriotic, hereditary, and historical bodies, and may designate special committees with representation from the above-mentioned bodies to plan and conduct specific ceremonies. The Commission may give suitable recognition such as the award of medals and certificates or by other appropriate means to per-

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sons and organizations for outstanding accomplishments in preserving and writing the history of the Vietnam War.

The President of the United States is authorized and requested to issue proclamations inviting the people of the United States to participate in and observe the centennial anniversaries of significant historic events, the commemorations of which are provided for herein.

The President of the United States is authorized to direct the Secretary of State to enter into negotiations with accredited representatives of the Governments of the Australasian and Great China Regions, the Dolphin Liberation Front, and the Linkage of Cybernetic Polities to seek means of jointly honoring the brave men, women, dolphins, and pre-sentient computers that participated in the Vietnam War.

There are hereby authorized to be appropriated such funds as may be necessary to carry out the provisions of this resolution, not to exceed $10,000,000.

Approved April 7, 2055.

DOCUMENT NUMBER 2

Memo from the President
To: Herb
From: NAR III
Subject: Attached Proclamation
Date: 12/6/56

Must I sign this? The only good thing about that messy war was that my grandfather was lucky enough not to have been elected during it—thus avoiding the ruination of our family name. Do you know we're still paying for the damn thing? There are a couple dozen veterans and a few hundred widows and dependents drawing benefits. And we won't finally close the books until the century is out!

DOCUMENT NUMBER 3

Office of the Assistant
to the President
for Peace and Freedom
December 6, 2056

Dear Mr. President:

Regarding the proclamation, I don't think we have much choice in the matter. Congress seemed to think that the Centennial observances would serve to immunize Americans against a reintroduction of war by ordering a revival of its boring and odious panoply.

As you point out, wars *were* expensive. The Vietnam episode has cost this country some five terabucks. And the human casualty list is not yet closed; some weeks ago, four Vietnamese children did not live to regret their playing with an unexploded artillery shell. But, if it's any solace, the last pension for dependents of Revolutionary War veterans was paid out in 1911. The last payments for the War of 1812 and the Mexican War were made in 1946 and 1962, respectively. Your own Administration is still paying for World War II and Korea.

A second beneficent output of the Vietnam War was that it forced *my*

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great-grandfather to join another hundred thousand refugees in the Great Emigration of '76. Thus, the fifty-fourth President of the United States was provided with this humble oriental braintruster.

S. Herbert Dinh

DOCUMENT NUMBER 4
Vietnam War Centennial
Proclamation No. 3883

By the President of the United States of America: A Proclamation

The years 2057-2077 will mark the one hundredth anniversary of the Vietnam War, also known as the Second Indochinese War.

That war was America's longest tragic experience. But like all truly great tragedies, it carries with it an enduring lesson and a profound inspiration. It was a demonstration of heroism and sacrifice by beings of both sides who valued principle above life itself and whose devotion to duty is a profound part of history's heritage.

Military history records nothing finer than the courage and spirit displayed at such battles as Pleiku, Hue, First and Second Khe Sanh, and Hamburger Hill. That America could produce men so valiant and so enduring is a matter for deep and abiding pride.

The divisions aroused by this war were fierce and deep. Yet, out of these divisions was born a new and transcending sense of unity and common national purpose. This unity, which inspired our ancestors to construct a greater, freer, and happier America, must be a source of inspiration as long as our country may last.

By a Joint Resolution approved on April 7, 2055, the one hundred and thirty-fourth Congress established the Vietnam War Centennial Commission to coordinate the nationwide and worldwide observances of the one hundredth anniversary of the Vietnam War. The Resolution authorized and requested the President to issue proclamations inviting the people of the United States to participate in those observations.

NOW THEREFORE I, NELSON A. ROCKEFELLER III, President of the United States of America, do hereby invite all the people of our country to take a direct and active part in the Centennial of the Vietnam War.

I request all units and agencies of government, federal, megalopolitan, state, and local, and their officials, to encourage, foster, and participate in Centennial observances. And I especially urge our nation's multiversities and think tanks, its libraries and museums, its churches and religious bodies, its civic, service, and patriotic organizations, its learned and professional societies, its arts, sciences, and industries, and its informational media, to plan and carry out their own appropriate Centennial observances during the years 2057 to 2077; all to the end of enriching our knowledge and appreciation of this great chapter in our nation's history and of making this memorable period truly a Centennial for all Americans.

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IN WITNESS WHEREOF, I have hereunto set my hand and caused the Seal of the United States of America to be affixed.

DONE this seventh day of December in the Megalopolis of Boswash in 2056 C.E., and of the Independence of the United States of America the two hundred and eightieth.

Nelson A. Rockefeller III

DOCUMENT NUMBER 5

Solarian HoloVision
"More Realistic Than Life Itself"
August 9, 2059

SHV's *That Old Da Nang Gang*

Dear Jane:

I have no moral qualms about cashing in on the public's nostalgia for a simpler day. I have a soft spot myself for the quaint old Soaring Sixties. Nonetheless, life in a twentieth century prison camp, under the very best of circumstances, was an experience far less idyllic than depicted on TODNG. On my trips and in my dreams, I am haunted by the ghosts of once-real people who were unfortunate enough to have been born in a lousy century and die in a lousier war. To salve my conscience and appease these shades, please let your actors suffer a little—not enough to arouse the ire of the UNCC—but some. As your cast loves to say, I am rather "uptight."

McGeorge Murdock
President, SHV

(Editor's Note: This memo was addressed to Miss Jane Fonda Rahman, Directress of *That Old Da Nang Gang* which appeared for three seasons on SHV.)

DOCUMENT NUMBER 6

Auction of Americana:
Bargains Galore!

Well-preserved memorabilia and relics of the latter years of the last century will be offered for laughably low prices at the greatest collectors' happening since the fall of Rome. Special rates obtainable on a wide variety of political buttons and posters; irresistible slogans include "I Like Ike," "Peace Now," "Who Lost Laos?" "Remember Milwaukee," "Bomb Ho Chi Minh City," "Gooks Go Home," "I Crave Dave," "All The Way With JPK," "Hands Off Zimbabwe," and "The Baptist Is Back." Bulkier *objets d'art* include antique TVs, early refrigerators, pot pipes, bugging devices, englassed moon rocks, and souvenir baseballs signed by the 1988 World Champion Fairbanks Braves.

This once-in-a-lifetime opportunity is yours tomorrow, May 5, at the Americana Auction, the Four Planets Antique Exhibition at Madison Square Garden, 7th Avenue and 78th Street, Manhattan 10024.

DOCUMENT NUMBER 7

Invocation at Abrams' Tomb by Reverend James B. Smith, Rabbishop of the Judeo-Christian Syncretist Ecumenical Church, on September 15, 2064, the Sesquicentennial of the birth of General Abrams.

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"Dear Lord: Bless Thy Servant, General of the Army W. Creighton Abrams, a warrior in Thy Name, before Bastogne, in Vietnam, and at the Defense of Sacramento. Bless also the valiant shades of those he commanded and those he opposed. And we especially implore, O Lord, help us preserve the peace of these last six decades. For Thy Name's sake. Amen."

DOCUMENT NUMBER 8
Transcript From CBS HV Broadcast, 6:46 p.m. EST, April 25, 2066

"One hundred years ago today, an American economist, John Kenneth Galbraith, remarked on the then-raging Vietnam War, 'If we were not in Vietnam, all that part of the world would be enjoying the obscurity it so richly deserves.'

"Today, it can hardly be said that Vietnam is an obscure part of our globe; though Sino-Malay race conflicts seem to have outlasted equally heated squabbles elsewhere, there are some happier notes to report.

"A century ago, the area where I'm now standing was part of what was then called the 'Iron Triangle'. To the north was 'Zone C' and the 'Fish Hook'; to the east was 'Zone D'. To the west was the 'Duck's Bill', later known as the 'Parrot's Beak'. All of these quaint, apparently innocuous expressions located bloody battlefields in what undoubtedly was the dreariest war ever conducted by American arms.

"Looking about this peaceful scene, it is difficult to imagine its being attacked by an American Army brigade whose commander could afterwards proclaim, 'I have entered the Iron Triangle and the Iron Triangle is no more!' Today, of course, viewing the graceful spiral towers on the outskirts of the Ho Chi Minh Sector of the Canton-Java megalopolis, it is immediately apparent that the 'Iron Triangle' is 'one with Nineveh and Tyre'.

"It is difficult to imagine that men fought and died not so terribly long ago to win the unassuming soil upon which I speak. As I holocast, other men disturb the bones of those who fell at Thermopylae, Waterloo, and Stalingrad for causes somewhat more noble. All died for what they felt were noble causes—causes ennobled by contemporary sloganry. Such slogans tended to be rather grandiose during the last century. The American First Division that fought hereabouts answered to the motto 'No Mission Too Difficult; No Sacrifice Too Great; Duty First'. The nearby Fourth Division modestly prided itself on being 'Steadfast And Loyal'. The more businesslike First Cavalry Division simply proclaimed, 'Move In On 'Em And Kill 'Em'.

"No doubt their brave adversaries rallied to war cries no less militant or bizarre. But today such echoes have faded. Vietnam has taken its rightful place in the world. This nation is unabashedly and especially proud of a native daughter born not fifty meters

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from where I stand: Luy Van Thuc, first woman and first Vietnamese to be nominated by a major party for the office of Secretary General of the United Nations.

"This is Fred Godwin in Ben Suc, Vietnam."

DOCUMENT NUMBER 9

Transcript From CBS HV Broadcast, 6:38 p.m. EDT, May 30, 2067

". . . Today, May 30, 2067 marks the two hundredth Memorial Day celebrated in this country. By Congressional fiat, it and Veterans Day, next October 24, will be the very last to be legally observed. Sponsors of the bill terminating the two holidays unanimously declared their continued respect for the few remaining veterans of the Millenarian Disorders, now numbering sixteen. There was, however, a strong consensus that warfare was, like cannibalism and slavery, a dark aberration of the past and best forgotten.

"Nonetheless, though the tidal waves of yesteryear's wars are but mere ripples today, their ravages are, as yet, not toally repaired—as this report from Fred Godwin in Tay Ninh, Vietnam illustrates. . ."

"Tomorrow, May 31, will witness the completion of a ninety-four-year-old dream. At 3:00 p.m., China Time, Pope Pham Cong Tac III, spiritual leader of eighteen million Cao Daists, will consecrate a magnificently imposing and beautiful building—half cathedral and half palace—as the new Holy See of his co-religionists. The vast structure, known locally as Vatican East, replaces the original gingerbread-like cathedral accidently destroyed by American bombs in 1973.

"The ruins of the old cathedral, located about a kilometer from here, have become a kind of Wailing Wall for Cao Daists across the System. There are few Americans among the many pilgrims, but surprisingly numerous Vietnamese can be heard praying for the soul of that errant bombardier.

"This is Fred Godwin in Tay Ninh, Vietnam."

DOCUMENT NUMBER 10

Dedication of the "Horrors of War Museum" at My Lai, Vietnam By Adam Clayton Powell V—Only Earthman to Win the Nobel, Lenin, and Lin Piao Peace Prizes.

" 'Father, forgive them; for they know not what they do.' So Luke records Jesus upon the Cross. Thus blessed were His tormentors, soldiers of the Third Gallic Legion.

"In the 1900-odd years between that trivial episode and the minor outrage by the equally proud American Division commemorated here today, hardly a single page of history remained unsplattered by the supreme atrocity of war, or for that matter, capital punishment. But, like that earlier sacrifice, the innocent blood spilt here was not shed in vain. It helped remind the world that the

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human toll of the best-intentioned crusades might be as little justified as any exaction by Philistine, Hun, or Nazi.

"I dedicate this 'Horrors of War Museum' in the firm hope that idealists and philanthropists of the future will uncover no opportunity to contribute new exhibits to this shameful monument to man's inhumanity."

DOCUMENT NUMBER 11
Excerpt from Official Guide, 2069 Moon's Fair (English Edition), Vietnam War Centennial

This is a small exhibit located just off Gagarin Levibelt in the shadow of the Cyborg Pavilion. Its shape is that of a contemporary American "Special Forces Camp." The pavilion's purpose is to remind fairgoers that Armstrong's Landing could only temporarily divert attention from the 1969 Summer-Fall Campaign of Earth's third most expensive war.

Piped music brings the visitor a medley of such contemporary favorites as "The Ballad of the Green Berets," "We'll Hang Le Duan From a Sour Apple Tree," and "Mademoiselle from Phnom Penh."

The simulated "Jungle Combat Game," which reproduces the famous "Charge Up Hamburger Hill," is by far the most popular of several simulated games.

Highlights

THE JUNGLE COMBAT GAME: Everyone will enjoy playing this near-perfect hallucinogenic simulation of the heroic "Charge Up Hamburger Hill." You, yourself, are an American "grunt" struggling to stay alive on the man-eating mountain. Admission limited to persons over eighteen Earth years with Cardio-Reliability Indices (CRIs) of .87 or above.

MADAME MINH'S MASSAGE PARLOR: American soldiers back from "search-and-destroy" missions liked to relax at old-fashioned massage parlors run by beautiful "dragon ladies." Let supple Asian hands rub away your aches and pains under Luna's one-sixth gravity.

FIND COSVN: U.S. President Nixon once ordered a whole army to go search for COSVN, the mysterious North Vietnamese headquarters. Perhaps you will succeed where he failed. If you can raise the fifty-star Old Glory over COSVN's walls, you receive an embossed certificate granting associate membership in the Sons (or Daughters) of the Cambodian Incursion. CRI limitation at .94.

SOUTHWARD HO: You are a North Vietnamese truck driver on the Ho Chi Minh Trail and must pilot your convoy past fierce Meo tribesmen, crewcutted spy chiefs, and South Viet paratroops—always under a fiery tempest of napalm and HE. Persons with CRIs of .89 or below not admitted.

TEST YOUR GRIP: In the last half of the Vietnam War many South Vietnamese were forced to travel clutching to the skids of U.S.

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helicopters. You, the player, are being evacuated from "Fire Base Liz" hundreds of meters above Laotian jungles. Persons with CRIs of .88 or below not admitted.

Other hallucinogenic games include: GUNSHIP PILOT, CAPTURE THE EMBASSY, YANKEE DIE, ROBIN HOOD AND THE U MINH FORESTERS, and THE LOVES OF HANOI HANNAH.

IMPORTANT: Under the provisions of the International War Toy Convention of 2004, children under eighteen are barred from admission to most of the above-mentioned exhibits. The pavilion souvenir stand is, moreover, not permitted to sell any representations of weaponry or war equipment other than uniforms.

DOCUMENT NUMBER 12

December 6, 2069
(Lunation 1252)

OFFICIAL INFORMAL
Muhamad Ali Olsen
Vietnam Centennial Commission
1231 B Street NW
Washington, Boswash 20099
USA, Earth

Dear Muhi:

When, oh when, will the Commission inform me, a poor civil servant, what I am to do with 21,473 leftover green berets and 6,520 pairs of black pajamas now that the Moon's Fair is closed? Were it not for the anti-littering provisions in the Fair's groundrules, I would dump them down the nearest crater—a green and black splotch to shine down on the Earth forever. The alternative is to ship them back from Tranquillity Base at the horrendous price quoted in my last formal missal.

Forget the newspad bubbling about how Luna has begun its second century on an upbeat note thanks to the big lift of the Fair. If you ask me, trying to tie our little Vietnam pod onto the moon landing liner was moronic. Having the Commission open a concession stand, much less a pavilion, was imbecilic. And for yours truly to have agreed to manage the greatest flop since the Elizabethan Diamond Jubilee disqualifies me as brain donor to an under-achieving chimp.

When will I get word on the surplus gear so that I can leave this acned planet?

Sincerely,
Robert Morris
Manager, Vietnam War Pavilion
123 Clarke Avenue
Tranquillity Base, MT, Moon

DOCUMENT NUMBER 13

Excerpt from Boswash News Times
Telepad: May 26, 2072

VIET, US UNITS MARK SECOND KHE SAHN

Detachments from the UN's 7th Spaceborne (101st U.S.) and the 13th Shielded (325th Vietnamese) Divisions paraded down Avenue St. Daniel Berrigan in colorful ceremonies marking the hundredth anniversary of the Second Siege of this beautiful metropolis of Khe Sanh. Parent units of the two divisions

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fought on opposite sides of the historic battle following the ill-fated U.S. "incursion" into North Vietnam after peace talks broke down over a dispute about war prisoners. The fall of Khe Sanh signaled the beginning of unprecedented convulsions in the United States. The "Milwaukee Massacre" evoked the "Berkeley Soviet," which in turn brought about the short-lived "Military Council for National Renaissance." Civil War was forestalled only by UN intervention on behalf of President Lindsay's Democratic-Republican coalition government.

Meanwhile, at Arlington Cemetery today, Vietnamese Consul Generalissimo Nguyen Tho Giap placed a wreath at the Tomb of the Five Unknowns. Some hours earlier, his American counterpart, Kimberley Cotrell, paid similar homage before the Eternal Flame in front of Ho Chi Minh's Mausoleum in Hanoi.

At the Peace Statue on Alcatraz Island, however, android militants disrupted a folk mass.

DOCUMENT NUMBER 14
Remarks of Senator Amundsen Drury (Eupsychic Biocrat of Marie Byrd Land) U.S. Congress. Senate., 144th Cong., 2nd sess., April 29, 2076. *Congressional Record,* C, 5709.

"Madame President, on my recent visit to Asia, I spent several days touring the impossibly overcrowded stretches of the Canton-Java megalopolis in pursuit of my eccentric hobby of collecting histories and memorabilia of the Vietnam War. My colleagues have often expressed considerable amusement at this strange impulse of mine.

"While I was deeply impressed by the traditional hospitality of my hosts and the total lack of bitterness over our past actions, I was deeply distressed at the complete disinterest in memorializing the brave men from many lands who fought across Indochina for an entire generation. At the Ia Drang Housing Complex, site of the 1965 battle, no space can be found for even a simple plaque. There is a faded plaque at Dak To but only in Vietnamese, a language virtually extinct, and even it has several letters missing. At A Shau there is nothing. At Pleiku, nothing survives to denote a historic battlesite.

"I do not ask for tourmobiles or fried chicken palaces or hallucinogenic simulators or dung-encrusted statuary though Lord knows—even in Antarctica—we have plenty we could export. I do ask why the Vietnam War Centennial Commission, whose profligate expenditure of taxpayers' dollars is a national disgrace, has not been able to cajole local authorities in Vietnam to put up a few inexpensive commemorative tablets.

"It once was said that Vietnam was a land with more history than a small country could properly absorb. Madame President, no visitor to Vietnam could ever believe that today.

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"One hundred years ago next month, President Lindsay made his famous address announcing a successful ceasefire—how 'The Mekong River once more flows unvexed to the sea.' For myself, I wish that I could vex those living along the Mekong to properly attest to the courage of fallen heroes."

DOCUMENT NUMBER 15
Transcript From CBS HV Broadcast,
10:03 p.m. EDT, May 18, 2076

"Today, May 18, 2076, marks the one hundredth anniversary of the ceasefire that ended, for America at least, the Vietnam War. Despite his antiwar sentiments, the recently installed President John Lindsay had been forced to resume tactical air attacks in South Vietnam, mostly from bases in Thailand, to protect the 50,000 beleaguered troops left in Vietnam by his impeached predecessor. In early May preliminary ceasefire accords were reached at the resumed peace talks in Paris. In a dramatic afternoon television address, Lindsay told the nation that its long agony was over. Tonight, CBS will switch over to two dimensional television to bring you excerpts from its nightly news broadcast reporting the events of that momentous day."

The CBS Evening News
With Walter Cronkite
Tuesday, May 18, 1976

ANNOUNCER: Direct from our newsroom in New York, this is the CBS Evening News with Walter Cronkite—and Nelson Benton in Berkeley, California, Dan Rather in Washington, Roger Mudd in Paris, Don Webster in Saigon, Ike Pappas in New York, Terry Drinkwater in San Clemente, California, and Hal Walker in Johnson City, Texas.

CRONKITE: Good evening. The word that the nation had so long awaited came today. At one o'clock Eastern Time, President Lindsay told us that the country's longest war was over. All U.S. troops on the Southeast Asian mainland will be out by September first. All bombings have ceased. All prisoners of war will be released. A naval armada will operate unharassed taking home troops and—through the rest of the year—any Vietnamese who wish to follow. There will be no "bloodbath." In a moving appeal, heard or seen by a TV and radio audience of some one hundred and eighty million Americans, the President urged his successors never to forget the bitter lessons of Vietnam.

LINDSAY: . . . There was an end to that tunnel and there is light at the end. It is not the warm glow of victory but neither is it the flush of a shameful defeat. It is rather the flaming determination of our whole people to never again take up deadly arms in defense of causes ungermane to our true national interests. I pray that no one who occupies this high office may ever come to believe that this determination may be safely disregarded . . .

CRONKITE: CBS will rebroad-

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cast the President's address immediately following this program.

The initial reaction to the sudden speech was stunned disbelief. Although peace rumors had initiated a wave of buying on the New York Stock Exchange, the lateness of the truce announcement means that its full impact on the market will only be felt tomorrow. The Dow Jones Industrial Average was up 12.69 at 1069.47 with the ticker closing fifteen minutes late.

In the colleges of the nation, students cramming for final exams took the announcement of Vietnam Peace with astonishing detachment. From the Berkeley campus of the University of California, Nelson Benton reports.

BENTON: In 1964, riots at Berkeley initiated a decade of student unrest. The college itself only reopened this semester after a three-and-a-half-year closure. Evidence of the destruction wrought during its "Soviet" period still abounds–in the physical damage and in the numbed expressions of the townspeople.

Today, with the Vietnam conflict halted, one would expect that anti-war activists would be ecstatic, yet business as normal seems to be the rule here. SDS spokesman Mark Meyer explains why.

MEYER: I think it's 'coz we've had so damn many peace rumors and hopes dashed–a lot of people still don't believe it. Also there's some feeling that the straights figure now if the war's over, all of us will shave and cut our hair and give up pot and it'll be the "Fabulous Fifties" all over again. Meet Son of Organization Man. Bleep. It won't be–ending the war was just item number one on a long, long list of things that have to be changed. And you can tell that to all your friends out there in Television Land.

CRONKITE: Elsewhere in the nation, however, there were thousands of instances of spontaneous demonstrations of gratitude. But, whereas most political demonstrations are usually almost all black, all white, all young, or all middle-aged–today's celebrants seemed remarkably representative of the entire community from which they'd been drawn. Dan Rather reports from Lafayette Park in Washington, D.C.

RATHER: Since 1:00 p.m., an estimated 25,000 people have assembled outside the White House in an apparent hope to see President Lindsay. They form what is probably the most jubilant crowd seen here since V-J Day. In fact, the similarity of the two occasions has led some of the more cynical celebrants to hoist signs proclaiming, "Happy V-V Day."

Many of the people here are government employees who simply never went back to work after lunch. Throughout Washington, the instinct that drives Americans to the White House at solemn moments of history operated to empty government offices, just as it did on a Friday afternoon in November, so many, many

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years and tears ago. This is Dan Rather outside the White House in Washington.

CRONKITE: A bittersweet, marijuana-scented celebration that included all ranks up to three-star general is said to have taken place behind the barbed wire that surrounds the Pentagon. This could not be confirmed at press time.

Marvin Kalb, however, reports that at least one Government Department is working overtime.

KALB: Telegrams and messages of congratulations from local embassies have been arriving here at the State Department all afternoon. Canadian Prime Minister Stanfield, Chancellor Barzel of West Germany, French President Pompidou, British Prime Minister Heath, Pope Clement, Israeli Prime Minister Sapir, President Sadat of the Arba Union and dozens of other world leaders have all expressed great praise of President Lindsay. Many add their heartfelt hopes that the United States, freed from its Vietnam adventure and its domestic troubles, will again be able to assume a major role in common efforts to solve the world's great problems.

Far more stinting in praise is this somewhat truculent statement by Premier Mazurov: "It is greatly to be hoped that the American aggressors have learned their lesson—that all their sinister schemes and massive weaponry could not prevail in the face of the united will of the Indochinese peoples. The socialist community must remain vigilant, however, against the kind of revanchism that disturbs our relations with the Federal Republic of Germany. It will be the duty of all peace-loving forces to insure that after its wounds are nursed, the wolf does not emerge from his den seeking easier prey. For the moment, we congratulate President Lindsay and hope his resolve for peace continues."

This is Marvin Kalb, CBS News, The State Department. . .

DOCUMENT NUMBER 16

Excerpt from Boswash News Times

Telepad: June 29, 2077

It Happened on This Day—June 29

1577—500 years ago—Peter Paul Rubens is born.

1927—150 years ago—President Calvin Coolidge catches seven trout.

1977—100 years ago—North Vietnam & U.S. exchange ratifications of treaty formally ending Vietnam hostilities.

2002—75 years ago—Kings Philip VI of Spain & Mohammed VI of Morocco open Gibraltar Tunnel.

2027—50 years ago—Cheetah Ham Muggs becomes first chimpanzee to graduate from a U.S. multiversity.

2052—25 years ago—College of Laity opens debate on proposed impeachment of Pope John XXVI.

2967—10 years ago—First System-wide pilots' strike shuts down commercial spacelines. ■

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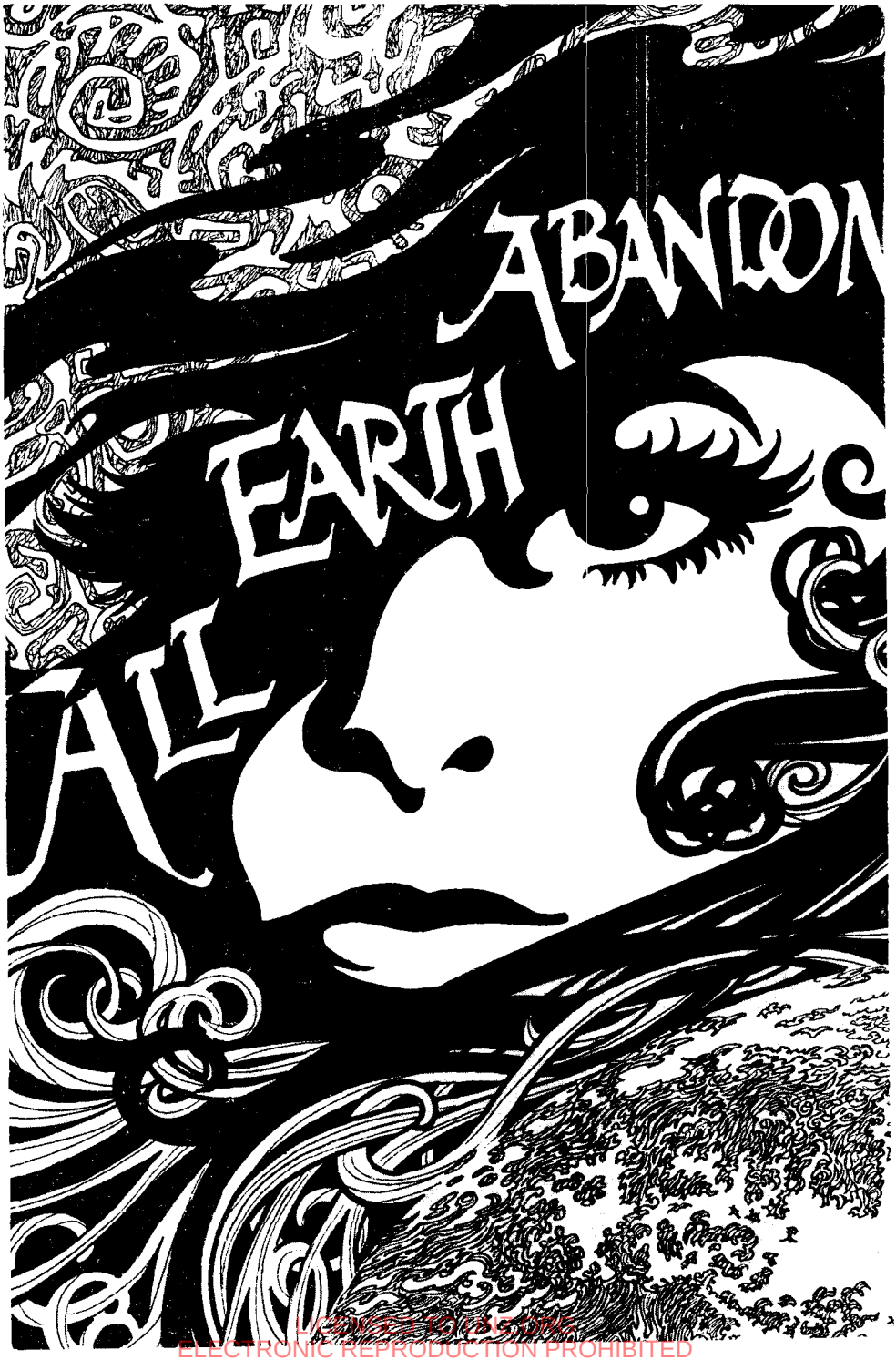

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GORDON R. DICKSON

The Pritcher Mass

Conclusion.

The basic idea of the Pritcher Mass was to use human extrasensory powers to make an escape to the stars. But that turned out to be only one possible use for the Mass. The real power of the human mind was capable of much, much more!

Kelly Freas

SYNOPSIS

Chaz (Charles) Roumi Sant, making the evening commuter run by sealed train from Chicago to his apartment in the Wisconsin Dells, is grimly angry with himself because for the sixth time he has failed to pass a test of his talent for chain-perception, an extrasensory ability that is required for work on the Pritcher Mass. The Pritcher Mass is a psychic construct, a nonmaterial "tool" being built out beyond the orbit of Pluto to enable humanity to locate and examine habitable worlds, to which a seed community of selected men and women can emigrate, to ensure survival of the human race. Humanity on the Earth itself is doomed within generations. Planetwide pollution has culminated in the development of a plant mutation called the Job's-berry Rot, the wind-borne spores of which, once inhaled, take root in the moist environment of human lungs and grow until the afflicted person literally chokes to death. There is no known cure. On Earth, what is left of socially ordered mankind live in sealed cities; anyone suspected of being infected by the Job's-berry spore is immediately exiled to the open planetary surface before he or she can exhale spores and infect others. Once outside the sealed environment, death from the Rot comes in a matter of months.

The only safe place away from the Job's-berry is the Pritcher Mass Project. Chaz has been determined to qualify for work on it; but every time

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he takes the chain-perception test, something seems to frustrate him in demonstrating the talent he is sure he possesses.

Meanwhile, his train is blown off the tracks, and the car Chaz is in is split open, exposing all within to the Rot. Infected or not, by law all those within must be exiled; but Chaz uses a nonsterile rock he picks up from the railroad ballast as a "catalyst" to release his talent for chain-perception and works out a way to smuggle himself back in among the still-sterile commuters being rescued from other cars.

At the Dells, Chaz returns to his locked apartment to discover there, Eileen Mortvain, a girl he had met only once before at a dimly remembered condominium party. She has been praying and meditating at his apartment's sterile Earth altar for his safety. As they are talking, they are interrupted by the reappearance of a woman Chaz had saved from the train. The woman tries to blackmail Chaz, threatening to tell the authorities about the unsterile "catalyst" rock Chaz has brought home with him.

The woman leaves and Chaz passes out. He has a strange dream about conversing with two aliens—one a giant snail, the other a large praying mantis. When he comes to, he hears Eileen singing an odd song to him. Eileen offers to help Chaz hide until he can qualify for work on the Pritcher Mass, which would give him immunity to any Earthside persecution. They go to her apartment, where she picks up a wolverine named Tillicum. With the help of the wolverine, she gets them all into the service tunnels connecting the basements of buildings. They ride a delivery belt toward an unknown destination; and Chaz, adding up a number of clues, accuses her of being a Satanist, one of a cult group said to have connections with the Citadel—as the organized crime world of their time is called.

She denies Satanism; but she does admit to being a witch. Witches are now recognized simply as men and women with paranormal talents who have for centuries formed an underground group of their own. Eileen takes Chaz to a "Witches' Hole" and there he meets a male witch known simply as the Gray Man, who is the coven's business link with the criminal organization, the Citadel. Eileen has no fear of the Gray Man because her paranormal powers as a witch are greater than his—in fact, greater than most. However, the Gray Man accuses her of having lost her powers, for the oldest of witch-legend reasons. She has fallen in love—with Chaz Sant.

Eileen is forced to try her powers against the Gray Man; and finds he is correct—at least for the moment, she is helpless. That is the last Chaz remembers, as the Gray Man "takes" him, and he falls unconscious.

He wakes in a place of no sound, light, or sensation. After a bit he reasons out that this is a sense-deprivation chamber, a modern version of the older device used in brainwashing. This illegal device confirms his suspi-

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cion that for some reason the Citadel wants him out of the way and now has him in its grasp. Chaz fights the sensory vacuum by using chain-perception to build an imaginary universe—and once more dreams of the snail and the mantis. He wakes this time to find himself being taken out of the chamber by two men in hospital coats, who evidently consider him reduced to helplessness. He overcomes them both, puts on the white uniform of one of them, and goes in search of Alex Waka, the Pritcher Mass examiner who has been testing him for chain-perception. He persuades Waka to give the test once more—and this time qualifies for the Mass, thus gaining immunity until the shuttle for his spaceship leaves.

Waka, in a sweat to get rid of him because he fears the Citadel, advises Chaz to take sanctuary with the Pritcher Mass authorities. Instead, Chaz goes in search of Eileen. When he finds her apartment empty, he phones a fellow apartment-dweller who says that Eileen is with her. Chaz is about to go there when the wolverine Tillicum materializes in the dim apartment hallway and warns him that the phone message is a trap. Tillicum tells Chaz that he must not try to find Eileen, and further, that he can save Eileen by going to the Mass.

Chaz obeys the message brought by the wolverine, goes to the Pritcher Mass Earth headquarters, and twenty days later, he is landed on the Mass. A tall, strikingly handsome, slim man meets him in the air lock entrance to the metal platform on which the nonmaterial Mass is being constructed. He gives Chaz one last chance to decide against working on the Mass. When Chaz does not turn back, the slim man accepts him as one of the Mass personnel, and introduces him to a legend carved over the door leading to the platform's interior:

"ALL EARTH ABANDON, YOU WHO JOIN US HERE."

The tall man is Jai Losser, Assistant Director on the Mass. He takes Chaz in to meet Lebdell Marti, Director of the Mass, and an extremely beautiful black-haired girl named Ethrya, Marti's assistant.

Marti reminds Chaz that the Mass is an attempt to make real what had been only a speculation on the part of James Pritcher (now dead), a psychologist involved in parapsychical studies. Pritcher had theorized that a group of paranormally talented humans could create a psychic construct that would operate unhampered by the normal physical laws of the universe: the Mass. But because the paranormal abilities of the human individuals building it are responsive to their subconscious as well as their conscious desires, there is no way of knowing what, really, they are building.

The Mass is intended to form a mental bridge between its platform and some possibly inhabitable world to which the seed community from Earth may emigrate, to begin life for the race again. But even if the Mass functions as it is supposed to, they still will not know what it actually is. It

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could be that they are building a psychic device that is only incidentally capable of doing what they want—as if they were constructing a jet airliner to pull a plow across a field.

Marti dismisses Chaz and Jai; and Jai takes Chaz up on the platform to experience the Mass. A sudden awareness of the Mass all around him moves in on Chaz like an inexorable force. Instinctively, he thinks of Eileen . . . and without warning, just as he collapses under the psychic pressure, he hears her voice answering his murmur of her name.

Chaz is several days recovering from his initial experience with the Mass. He awakens on the morning of the fifth day, to find Ethrya sitting on his bed. She explains that Chaz' first experience with the Mass was a "hallucination" and invites Chaz to go up to the Mass with her on one of her work shifts with it, to learn to control ("meter") the effect of the Mass. No one, says Ethrya, can take the full effect without self-protection.

They go up to the Mass. But then, abruptly, Ethrya is called back inside by Marti. Chaz, so far untouched by the Mass this time, says he will stay. Ethrya warns him to be on guard against another Mass-induced hallucination.

No sooner has she left, however, than he feels a strange coolness inside the right elbow of his suit, as of a hypodermic spray. A second later and a hallucination begins to hit—but it is a drug-induced hallucination. In panic, Chaz calls on Eileen again as the universe seems to go to pieces around him. She begs him to hang on to contact with her, but he starts to lose it in spite of himself. In desperation, he turns to the Mass—and the Mass responds.

It comes, completely uncontrolled, like some inconceivably great wind scattering everything in its path, including the drug effect. Rescued from that now, but helpless in the tornadic psychic storm of the Mass-force, Chaz for a while is mentally tossed about; but he begins to learn how to ride the force. Gradually, he gets control and is once more able to contact Eileen. She tells him then that she is being held by the Citadel, but the Citadel people have promised to turn her loose soon. However, she has learned that the Citadel considers Chaz unusually potential both in use, and in danger to itself; not because he is particularly powerful psychically, but because of the capability of his extremely powerful independence of spirit to influence the Mass. The Citadel plans that the seed community that escapes from Earth is to be composed of its own people only; and Chaz might threaten this.

At that moment they are interrupted by Chaz' suit phone and a call from Marti, ordering him back inside the platform.

Chaz is accused by Marti of having another hallucination (which was the intention of whoever drugged him) and is forbidden further excursions to the Mass until he has been thoroughly checked out. For eight days Chaz is

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kept inside the platform; but finally Marti agrees to give him one more chance to prove that he did not hallucinate, but did—as he claims—gain contact and control over the Mass. If he fails, he is through for good.

Chaz reaches for the Mass, and contacts it. It is his intention to show Marti a contact with the dream world of the imaginary Snail and the Mantis he has envisioned twice previously. Using the Mass, he reaches out; and finds the two creatures to be actually real and alive on the world of their existence. Once more he speaks to them; but the Mantis tells him bluntly this time that they cannot and will not let themselves be used to help him, and that all doors among the stars are closed to his race. He is the only human they have ever told of this, says the Mantis, because he is the only one who has come and found them.

Chaz retorts that he first found them when he was still on Earth, millions of miles from the Mass. The answer to that is a blockbuster.

"The Mass," replies the Mantis, "is on Earth."

Abruptly, this statement opens up great universes of linked cause-and-effect, to Chaz' ability of chain-perception. He follows what he perceives; and it leads him away from the alien world, in search once more of Eileen, on Earth.

He contacts her, and she tells him that the Citadel has let her go. But she goes on to say that the Earth is special to all witches, which is why none of them have seemed to want to qualify for the Mass. She would never leave Earth and he is not coming back; it is best that they break contact permanently . . .

A furious suspicion is building in him as she talks. Something is wrong. With an effort he uses the Mass to bring forth a picture of where she is; and suddenly he visualizes her. She is stumbling along a grassy hillside, in the open.

"You're outside!" *he explodes. "Why didn't you tell me they'd put you out of the sterile areas to die?"*

At this, Eileen breaks contact; successfully shutting him out completely, because her paranormal powers are so much stronger than his. Grimly, he determines to go back to Earth in person to find and save her—and to make the Mass move him there. He no longer has Eileen as a target to aim at; but he concentrates on the hillside where he last saw her and successfully makes the transition. He appears on the hillside in his physical body; but Eileen is now no longer there. He follows the route he thinks she must be taking; and this leads him to a combination country-store/farmhouse, booby-trapped and rigged with automatic defenses. He gets past the defenses safely, however, and follows his nose upstairs in the farmhouse—to the decaying body of a man, dead several days, and to Eileen, unconscious.

Chaz drags the dead body out and goes back upstairs, taking the steps two at a time to Eileen. She is awake, but she does not recognize him. A high fever makes the skin of her fore-

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head burningly hot; and on her neck he finds small, reddish, inflamed patches of skin—the first signs of infestation by the Rot.

Part 3

XI

His first thought was to get her some water. Looking around the dim room he caught sight of a five-gallon milk can not far from the stove. He went to it and lifted it. It was heavy and sloshed with contained liquid. He worked off the tight, heavy cover and saw a colorless liquid within.

Cautiously, he tasted it. It was certainly water—how clean and how pure, there was no way of telling. On the other hand, this was no situation in which he could pick and choose. A small aluminum pan with a bent handle hung from a nail in the wall nearby. He half-filled the pan with water and, taking it back to the bed, managed to lift Eileen's head and get her to drink. When she realized there was water at her lips, she drank thirstily, but without coming out of the delirium of her fever.

He took the empty pan back to its nail and set about examining the room they were in. The removal of the dead body and the door he had left open had improved the air considerably; but the coolness of the place was now beginning to be noticeable. It could be frigid in here before dawn.

A distant, crying voice halted him like the sudden pressure of a gun muzzle against his ribs.

"Rover, Oh, Rover . . . Red Rover . . ."

The cry came from outside somewhere. But, if his ears were right, not from the same quarter of the open fields as the earlier voice, which had sounded behind him. A moment later his hearing was vindicated, as the voice he had first heard called again, this time plainly from the same direction as before.

"Rover. Red Rover . . ."

It had barely finished before two other voices sounded, each from yet another direction. He stepped quickly to the window and looked out.

He saw nothing. He squinted against the feeble glare of the red-stained clouds behind which the sun must be almost on the horizon; but he still saw nothing. Looking back into the room, he let his eyes adjust and glanced around. If the dead man he had just gotten rid of had been holed up here, he might have had some means of observation—

He found what he was looking for: a pair of heavy binoculars hung by their strap almost beside the window. He had stared right at them earlier, without recognizing the purpose in their position. He reached for them now and held them to his eyes.

They were powerful—possibly even 7x10—and for a long moment as the light faded, he could not hold them steady enough to sweep a hill-

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top area a few hundred meters away. Then he got one elbow braced against the window frame on one side, and began to look along the hilltop.

He saw nothing, and was just about to put the glasses away again when a figure rose to its feet as casually as if it was on a street back in one of the sterile areas. Chaz had already lowered the binoculars and he saw the figure without their aid. He jerked the binoculars back to his eyes and hunted for the shape he had just seen, sweeping past it twice before he could hold it steady in his field of amplified vision.

It was a man wearing a bulky red sweater and the lower half of a jumpsuit. In the binoculars, he seemed to leap forward at Chaz—it was like looking at him from an actual distance of less than a dozen meters. Chaz blinked—for he had seen the face before. It was the face of the man he had seen sprawled, apparently dead, beside the wrecked railway motor cart and spilled cartons, when the train in which Chaz had been wrecked was halted by an apparent sabotage attempt miles before the real thing stopped it.

Chaz continued to stare at the face he recognized. This man was not dead—in fact, he was looking damned healthy considering the ulcer spots Chaz had seen on his neck before the train wreck and which were still there now. As Chaz looked, the man cupped his hands on either side of his mouth and shouted in the direction of the buildings.

"Rover! Red Rover! Red Rover, come over . . ."

The cry seemed to linger under the darkening sky and the red-streaked clouds behind the man. Then he took one quick step backward, as if he stepped down below the brow of the hill, and disappeared.

As if his going had been a signal, the red streaks began to fade, the little glare dwindled from the clouds; and the light began to fade with a rapidity that woke Chaz suddenly to an awareness of his situation.

He hung the binoculars hastily on their nail and turned. Somewhere in here, there must be some means of making a light. He looked instinctively toward the stove and saw nothing useful there. He looked about the room, and actually looked past—before he had the sense to bring his eye back to it—an antique oil lamp. Its appearance was a cross between that of a gravy boat and a pointed-toe slipper, badly modeled in cheap crockery, standing on the table in the room.

It was, in fact, an imitation of an ancient lamp from the Mediterranean area. He had seen the same sort of thing advertised as an aid to meditation. He pounced on it, found it half-filled with liquid and with a rag of porous towel-plastic stuck in its spout-end for a wick. There was a quite modern fusion incense lighter on the table beside the lamp, and a

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second later he had the wick lit. A wavery illumination from the bare flame lit up the room.

He spun around to the window, cursing himself. Their lighted room would stand out like a beacon. He recognized then one of the things he had glanced at and ignored before, thinking it to be no more than a chance roll of cloth above the window. It was a curtain, hung on nails. He stepped to it now and unrolled a blackout shade consisting of several layers of dark cloth backed by a sheet of opaque, gray plastic.

He arranged it over the window, and turned back to do a thorough job of exploring the room. As he moved slowly about it, checking everything he found, he was astonished at how much in the way of useful equipment was contained within its four walls. Much of it was makeshift, like the old-fashioned milk can that held their water supply. But much of it also showed the result of ingenuity and work—a great deal of work for a man who could hardly have survived the Rot for more than a couple of months while he was setting up this place.

There was food, fuel, weapons, ammunition, spare clothing, soap, a few medicines ranging from aspirin to capsules of a general antiviral agent—even, tucked in one corner, a box of what seemed to be home-brewed beer. Having completed his survey, Chaz turned to the most immediately important matter of getting some heat into the room. It was possibly his imagination, but the temperature seemed to be dropping very fast.

He covered Eileen with the available bedclothes, and this time she did not throw them off, though her head was still very hot. He gave her another drink of water and turned to the stove. There was paper, kindling and wood chunks piled beside it. Using the incense lighter, he got a fire going; and much faster than he would have expected, the stove was throwing out heat.

He went to the window and pulled the edge of the blackout curtain aside a fraction. Outside, the permanently clouded night was full-fallen; and the darkness was as complete as that mind-darkness he had encountered on the Mass when he had tried to make verbal contact with Eileen. The similarity triggered an inspiration in him. What was the use of having achieved his partnership with a psychic force like the Mass, if he did not put it to use? Maybe the Mass could help Eileen.

How?

The immediate question that popped into his mind was like a brick wall suddenly thrown up in his way. He replaced the blackout curtain and stood by the window, looking across at Eileen under the covers of the bed, and thinking. Wild possibilities chased themselves through his head. Maybe the Mass could be used to transport Eileen back in time to a point where she had not yet in-

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haled any of the Rot spores—to a time when she was still safely inside the protection of the domes and air locks of the sterile areas. Maybe the Mass could alter the facts of the situation so that she had never been infected with spores at all. Maybe . . .

His thoughts lit up with a new enthusiasm. Maybe the Mass could be used to remove the spores already in her lungs—to rid her body completely of all physical elements of the Rot? Certainly the Mass was able to transport physical objects like his body from the Mass to here . . .

His enthusiasm faded. Considered coldly, even this began to look like a wild hope.

However, it would not hurt to tie the Mass in to both Eileen and himself under the general command to aid and assist them. He reached out with his mind for contact with the massive psychic construct, willing himself to imagine it and his connection with it as he had experienced it and pictured it back above the platform . . .

. . . And touched nothing.

The same wall of blackness he had not been able to push aside when he had last tried to contact Eileen verbally, now barred him from the Mass itself. He struggled to get through the barrier but it was no use. In her delirium, Eileen was still blocking her immediate area from the platform and the Mass, where she thought he still was.

He gave up and returned his attention to the room, looking across it to where she lay on the bed. She was apparently asleep, if restive with fever; but evidently sleep and sickness together did not interfere with unconscious use of her paranormal talents. Until her fever went down enough for her to recognize him, there was no hope of his reaching her to inform her of the changed situation.

Well, he told himself, there was no use getting worked up about it. On the bed Eileen stirred restlessly and licked her lips again. He took her another drink, and lifted her head while she drank thirstily.

"Eileen?" he said. "It's me—Chaz. Chaz."

But her eyes stared past him. Gently, he laid her head back on the pillow; and she shifted it immediately away from the spot where he laid it down, as if the pillow bothered her. He reached to plump it up for her, and felt something hard beneath it.

He lifted one end of the pillow, caught a glimpse of something dark, and drew it out. It was a thick black notebook with a sheaf of folded papers, larger than the pages in the notebook, pushed between its front cover and the pages.

He took it over to the table where the oil lamp burned smellily, and pulled up the chair. Seating himself, he opened the book and took out the sheaf of papers. They were folded lengthwise, in a bunch. He unfolded them. The writing at the top of the first sheet was printed in large let-

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ters: LAST WILL AND TESTAMENT.

He looked down at what was written below.

"I, Harvey Olkin, being of sound mind and body except for dying of the Rot, hereby bequeath this place and everything in it to whoever finds it after I'm gone; just as it was bequeathed to me by the man who was here before I was. And the only thing I ask of whoever takes my place, is that he or she bury me down in the yard, like I buried the man before me and he buried the man before him, and so on. It's not much to ask, considering what you're getting and how it's been passed on down by four people already. We're giving you the chance to die comfortable, which almost nobody shoved outside gets; and all any of us ever asked is that you take good care of the stuff while you still can, and finish the job by burying whoever took care of it before you—in this case, me.

The whole story is in the diary, which you ought to keep up, like the rest of us did. If you play fair, maybe the next one will bury you, too, when the time comes. Maybe you don't want to think about that just yet; but take it from me, when the breathing begins to get hard toward the end, you take a lot of comfort out of knowing you'll be put down in the earth right, the way people ought.

Anyway, that's how it is. The other papers under this one will give you what you need to know to run things and keep the Rovers and scavengers away; and the rest of the story's in the diary. This is about as much as I've got strength to write now.

Harvey Olkin

In fact, the handwriting had become more and more illegible toward the end of the message and the signature was a scrawl. Chaz would not have been able to decipher it at all if Harvey Olkin had not written his name more plainly at the beginning of the will.

Chaz checked through the rest of the loose papers. They were sketches, descriptions and lists dealing with the house, its supplies and defenses, in careful detail. Plainly, each new owner of the house had added to its strength and comforts in various ways. Chaz put the loose papers aside and began to read through the diary. It commenced with entries by the first man to hole up in the house, a nephew of the family that had owned it before the coming of the Rot; a man who had deliberately sought this place out when he was exiled from the sterile areas for some unmentioned civil crime.

It was two hours before Chaz reached the blank pages in the book where the record ended. When it was done, he sat in the light of the guttering oil lamp, already several times refilled, feeling closer to these four dead men than he had to anyone in his life, with the exception of Eileen. There was something right here—something that chimed in with his own feelings—about the way these

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four had spent their last days under the shadow of a certain death. Just as there was something wrong about a whole race of people bottling themselves up in small enclaves of sterile environment and waiting passively for an inevitable end. He could not believe that they were so passively waiting. Something, his instincts said, was wrong about that notion. It was the same sort of wrongness that had driven him to try for work on the Mass rather than yield to the same defeatism. If only he could find some evidence of others troubled by, or rejecting such defeatism, he had thought once. Well, here were four others who had seemed to reject it, at least in part.

Perhaps though, he thought, that was the trouble. They had not rejected it fully, as they should. They had not rejected it quite enough.

He chewed his lower lip. Somehow, there must be a logic-chain that would fit it all together to his satisfaction. All of it—the Rot, the sterile areas, the Mass, these four . . . But the connections he sought seemed to slip away from him just as his mind grasped them. Perhaps the puzzle was not complete. There could be parts missing . . .

He gave up, wrapped himself in a blanket, settled himself in his chair, and slept.

When morning came, Eileen was still delirious with fever and still did not recognize him. In between moments of caring for her, he investigated the place they were in and the loose sheets of paper from the diary in his hand. What he found amazed him all over again.

To begin with, all four buildings in the group—the store up in front of the house, the barn, a sort of garage-like building beside the house toward its back, and the house itself—were connected by tunnels. Each one had an observation point near the peak of its roof, from which he could get a quick view of the surrounding area. The garage-like building held the remains of two ancient cars and a remarkable array of metal and woodworking tools. In the basement of the house itself, the power pump unit with its dead fusion pack had been disconnected from a wellhead, and a hand-pump fitted onto the pipe to bring up water. Extra supplies of firewood and a veritable mountain of canned goods were stored in the same basement.

Chaz discovered that once he had covered some five meters of distance in the open from the back door of the house, he was in an area where the house, the barn, and the garage structure shielded him on all sides. It was here that the three previous graves had been dug; and it was here that, on that same afternoon, Chaz fulfilled his duty of burying the body of Harvey Olkin.

He took one of the rifles along with him on the task. He had never fired one; but the drawings and instructions on the loose sheets of paper were explicit. When he was done, he took the rifle back upstairs

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to the room where Eileen was and left it there, leaning against the wall, while he searched the fields about them with the binoculars from windows on all four sides of the house.

He saw nothing; and he was just putting the binoculars away, back on their nail beside the plastic-covered window, when a movement out in the field caught his eye. He dropped the glasses, snatched up the rifle, pointed it and pulled the trigger—all without thinking.

There was a shell in the chamber of the weapon; but the hammer merely clicked harmlessly on it. A dud. The diary had warned that the ammunition for the guns was getting old and unreliable.

A little sheepishly, Chaz lowered the rifle. If it had gone off, he would have fired through the plastic sheeting doing service as a windowpane. A waste of good material. The momentary check had given him time to think. The movement he had seen was still a good fifty yards from the house. Anyone crawling through the weeds at that distance was in no danger of rushing them suddenly.

Chaz put the gun down again and once more picked up the binoculars. He had to wait until he saw the weed-tops sway unnaturally before he could locate what had caught his eye in the first place. But when they did, he was able to focus the glasses in on it, and the figure of a man in a red sweater and the lower half of a jumpsuit became easily visible. He was crawling toward the house, dragging something long and metallic-looking with him.

Carefully keeping his attention on the spot, Chaz put down the binoculars, loosened and folded back a corner of the plastic window-covering and took aim with the rifle through the opening. Now that he knew where the man was, he could make him out fairly easily, even with the naked eye. He lined up the sights on the back of the red sweater . . . then found he could not do it.

It might be one thing to shoot the man if he was coming up the stairs at them, but to put a bullet in him while he was still just crawling through the field in their direction was something Chaz was not yet up to doing. Carefully, Chaz aimed well wide of the crawling figure, and pulled the trigger. The rifle clicked. Another bad round. The third time Chaz tried, however, sound exploded in the room and the gun walloped his shoulder. He saw a puff of dust out in the grass a good five meters to the left of the figure.

The next thing that happened was unexpected.

There was a sharp crack above his head, and a smell of burning. Chaz looked up, startled, to see a smoldering hole in the wall above the window and another, blackish hole in the plaster of the room's ceiling. Chaz felt cold. He knew next to nothing about firearms, but he knew more than a little—even if the knowledge was essentially theoretical—about laser guns.

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"All right in there!" a voice cried from the field. "Now you know. I can play rough, too—but I don't want to. I just want to talk to you. All right? I'm willing to come in if you're willing to come out!"

Chaz stood, thinking.

"How about it?" called the voice from outside.

"Hang on to your teeth, Red Rover!" Chaz shouted back. "I'll tell you in a minute."

"I'll come into the yard, no weapons. You come out of the back door, no weapons. I just want to talk. Make up your mind in there."

Chaz came to a decision. Snatching up the rifle he had used before and an extra handful of shells, he ran out of the room, downstairs to the basement and through the tunnel that connected with the garage. The garage had a service door opening inward on the yard, screened by barn and house from the fields around. He opened the door softly, reached out and leaned the rifle against the side of the building, then ran back through the tunnel and upstairs once more to the room where Eileen lay.

"What about it?" the voice was calling from outside. "I'm not going to wait all day."

Chaz struggled to get his breath back, leaning against the wall. After a moment, he managed to call an answer.

"All right. Be right down. I'll step out the back door. You stand up at the edge of the yard. Suit you?"

"Suits me!" the answer floated back.

Chaz turned and went out again and down the stairs toward the same back door by which he had entered the house the day before. He went slowly, making sure he got his breath all the way back before he reached the door. When he did, he opened it cautiously. There was no one in sight. The weeds hid the other man, if indeed he was where he had promised to be.

"You there?" called Chaz through the door.

"I'm here!" The answer came from approximately where it should in the weed tangle.

"I'm going to count to three," Chaz called. "When I say 'three', I'll step out the door and you stand up. All right?"

"Hell, yes!" The answer was almost contemptuous. "I keep telling you I only want to talk. If I wanted something else, I could burn that place down around your ears before dark."

"Don't try it!" said Chaz. "One . . . two . . . three!"

With the last word, he stepped out on the back step. The man he had expected to see, the man he had viewed in the binoculars and seen apparently dead at the train wreck, stood up at the edge of the yard. He did not wait for Chaz to speak or move, but calmly started walking forward, empty-handed.

Chaz broke and ran, at a slant toward the garage building. In ten

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long strides, the garage itself cut him off from the sight of the advancing man. Chaz snatched up the rifle and turned around with it aimed.

"Take it easy," he heard the voice of Red Rover saying as he approached the corner of the garage. "I told you talk, and I meant talk—"

He stepped into view around the corner of the house, saw Chaz with the rifle, and stopped abruptly, but without obvious alarm. Whatever else might be true of him, he had courage.

"That's pretty dirty pool you play," he said. He waggled the hands at his sides. "I said I'd come unarmed, and I did."

"And there's no dirty pool in bringing a whole gang against this one place?" Chaz answered, still keeping the rifle on him. "I don't know about you. I'm out to stay alive."

"Who says I want you dead?" Red Rover's eyes flickered over toward the graves, and his face grew shrewd as he stared at the one Chaz had dug so recently. "Girl die?"

"What girl?" demanded Chaz.

"You know what girl. She's the one I wanted to speak to you about. If she's dead already, that's an end to it."

"I don't know what you're talking about," said Chaz.

"You're a headache," Red Rover said. "You can't seem to get it through your skull I'm not against you. Hell, I've been keeping the Rover packs off your back for two years now. You didn't think you were doing it all alone, did you?"

He stared at Chaz challengingly.

"Go ahead," Chaz said. "You're doing all the talking."

"That's all there is to it. If the girl's dead, there's no problem. If not, I have to stay next to her until she is. The only thing is, I have to know for sure that she's dead. If it's her you've got buried there," he nodded at the recent grave, "you're going to have to dig her up so I can see her."

On the verge of telling him in plain Anglo-Saxon what he could do with himself, Chaz checked. There was some kind of mystery involved in all this; and he was more likely to get answers if he sounded halfway agreeable.

"No," he said, briefly.

Red Rover gazed shrewdly at him once more.

"Who was she?" Rover asked. "Some relative? She had to know the place was here. They put her out of a Gary, Indiana air lock; and she came straight here. Over sixty klicks—forty-three miles according to the old road system, only she went straight across country. Sorry about that; but I've got to see her dead, if you want to be left alone."

Chaz made a decision. After all, he still had the rifle and Red Rover was unarmed.

"She's not dead," he answered. "I'll show her to you." He gestured with the rifle barrel at the back door of the house. "In that way."

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Rover turned and headed for the door. Chaz followed, carrying the rifle along his right leg and side, shielded from whoever might be in the fields watching. They went through the rooms and upstairs into the room where Eileen still lay in her fever. Red Rover looked dispassionately down at her, stepped to the side of the bed and peeled back one of her eyelids, then examined the inflamed spots on her neck and upper chest area.

"She's on her way," he said, stepping back from the bed and looking at Chaz. "Maybe she's got four months yet, maybe only ten days more. But she's caught it. Lucky the worst is over—except for the choking at the end. She'll be coming out of that fever any time now. But I suppose you know that as well as I do. She's as good as dead."

"No," said Chaz. "She won't die."

He had not expected to speak with such intensity; and the suddenly deep, harsh tone of his voice startled even him. Apparently it startled Red Rover even more, however; for the other man shied like a startled horse, taking half a step back from Chaz.

"What do you mean?" Rover snapped. "You don't mean she's another? You don't mean it runs in families?"

"Families? What runs in families?" Chaz demanded.

"What do you think I'm talking about?" retorted Red Rover. "The same thing you and I've got in common. The reason I've helped keep the scavengers off your back these last two years—though you don't seem to have appreciated it much. Don't you realize we've got to stick together, us immunes?"

XII

"So that's it," said Chaz. "You're immune to the Rot."

"Didn't I say so? Just like you—" Red Rover broke off. "Wait a minute, friend. You *have* been living here the last two years, haven't you?"

His face changed, swiftly. Just as swiftly, Chaz brought up the muzzle of the rifle, which had sagged floorward during the conversation.

"Easy. I'm immune. So's she," said Chaz. "But no, I haven't lived here for two years. You've got a lot to learn, Red Rover. But so have I. Let's talk it over like sensible people. I'll give you my promise we're on the same side."

"Are we?" Rover's face was still tight. He looked over at Eileen. "How come she's sick then, come to think of it? I never did get sick." His hand went to the ulcer-appearing spots on his throat. "I got so I painted these on in self-protection."

He looked back at Chaz.

"She's sick because she thinks she ought to be," Chaz said.

"Ought to be?" Red Rover stared. "How do you know that?"

"Because that's the way the logic-chain runs," said Chaz. The other's features kept their expression. "Don't you know about Heisenberg-

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ian chain-perception–the Pritcher Mass?"

Red Rover's face relaxed. "Sure, I've heard all about that parapsychological crazy-business. You're not trying to tell me there's something to it?"

"Of course," said Chaz. "Why shouldn't there be?"

"Why," said Rover, "because it's just another one of those Government boondoggles. They're all alike. A bunch of politicians have to justify their jobs; so they dream up something to spend the product of the working citizen. The thing they dream up is always some of that rarefied junk that never had a chance of working; but it keeps people's minds occupied for a few years until they have to scrap it and dream up something new."

Chaz stared at the other man. It was hard to believe that the ignorance Red Rover was professing could be honest. On the other hand, if it actually was honest–Chaz felt a silent explosion of understanding, in his mind. If it was honest, it could lead to an explanation of why this man had survived while the four who had occupied this house had died of the Rot.

". . . But you're trying to tell me it works?" Rover was saying.

"Look," Chaz said. "Take the chair, there. I'll sit down on the side of the bed, and we'll start from the beginning."

They sat down.

"All right," said Chaz. "Werner Heisenberg was a physicist. He stated you could know either the position or the velocity of a particle exactly, but not both exactly, at the same time."

"Why not?"

"Wait, please," said Chaz. "I'm no physicist, myself. Let's not get tangled up in explanations right at the start. Heisenberg produced this Principle of Uncertainty. From that, sometime in the 1960's, came the notion that alternate universes might actually exist."

"Alternate whats?"

"I flip a coin or a token," Chaz said, "it lands tails. I win a bet from you because of that. Things go on to happen as a result of that bet. That's one universe of possible results. But what if it landed heads? Then you'd win. Different things would go on to happen from *that.* That'd be another possible universe."

"I don't–"

"Never mind," said Chaz. "Just go on listening. Suppose every time there was an either-or, two-way choice, the universe split into two universes, with one chain of things happening as a result to make things one way, say from the coin coming up heads; and one to make them another, from it coming up tails. Each chain would be a chain of logical results–what we call a logic-chain. Do you follow me there?"

"No," said Red Rover.

"Do you know the poem," Chaz asked, "that goes, *'For want of a nail,*

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a horseshoe was lost. For want of a horseshoe, a horse was lost—'"

"Sure—

'For want of a horse a rider was lost,

For want of a rider a message was lost,

For want of a message a battle was lost.

And all for the want of a horseshoe nail!'

"I see," said Red Rover. "In one universe they lose a nail and pretty soon they lose a kingdom. In the other, they have the nail and they get to keep the same kingdom. So that's a logic-chain, is it?"

"Right," said Chaz. "Now, since there're two-way choices like that happening all the time, somebody who could look ahead and see which way each split-off chain might go on each choice he made, could pick and choose just the right choices he needed to get him the final result he wanted. Follow?"

"Go on," said Red Rover.

"Right, then. Now, this world of ours is sick and getting sicker. Regular physical sciences are up against impossibilities in the way of time and distance, in finding a new world for people to escape to so they can survive. But nonphysical science can maybe ignore those impossibilities, to build us something to find a world and get us there. So suppose we decide to use chain-perception to build the nonphysical help we need. We start with knowing what we want—a something to get a clean, fresh world for us—and with that end in mind, we start picking and choosing, first among immediate either-or choices; then among the choices that result from that picking and choosing. And so on. A man named James Pritcher sat down to do that, just as an academic exercise, fifteen years ago; and what he came up with was that somewhere out beyond Pluto we needed to begin trying to create a nonphysical device, a psychic machine that we could use to find a way to the sort of world we wanted and a way to get us all to it."

He paused to draw a breath.

"And that's it," he wound up. "That's what the Pritcher Mass is, a psychic machine; and it's already mostly built. I just came from there. I can use chain-perception. That's why I tell you I'm not going to catch the Rot; and Eileen's just suffering from an imaginary case of it."

There was a long silence after he finished. Red Rover stared back at him for a while, then looked at Eileen, then back at him.

"So," Rover said, "her name's Eileen, is it? They never did tell me her name."

"Who's they?" Chaz demanded.

"The Citadel people." Red Rover stood up and Chaz snatched for the rifle. "Put it down. You're right. We've got a lot to talk about; but I'm going to have to go back outside now and do a little talking on my own, or you'll have all fourteen of my Rovers

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on your neck to rescue me from you."

He looked around the room.

"You've got some way of making a light here at night, haven't you?" he asked.

Chaz nodded.

"All right then, I'll come back just at dark and we can talk at night when none of them know I'm spending time with you. Leave that door downstairs open for me about sunset."

He went out; and Chaz heard his boots clattering down the stairs. For a while after the sound of them had ceased, Chaz continued to sit where he was, thinking. Eileen was immune to the Rot because she was a witch—that is, because she had paranormal abilities. If he, himself, was immune to the Rot, as the logic-chains he considered seemed to show, he could swear it was because he had proved to himself he also had paranormal abilities. But here was Rover, who was also immune, and didn't even believe in paranormal abilities, let alone having any. Or did he?

It would be interesting, thought Chaz, to find out.

That afternoon, as Chaz was busily marking *x*'s, *o*'s, and squares with a graphite lubricating pencil from the garage, on one side of a stack of small pieces of paper he had made by tearing up a blank sheet from the diary, he heard his name called.

"Chaz? . . . Chaz?"

It was a very weak voice calling, but it was Eileen's voice. He got up hastily and went over to the bed. She looked up at him with eyes that recognized him; and when he put his hand on her forehead, the forehead was cool and damp.

"What are you doing here, Chaz?" The words were barely more than whispered. Her eyes roamed around the stained plaster of the ceiling above her. "Where are we?"

"Outside," he told her, sitting down on the edge of the bed beside her.

"Outside? I thought perhaps I was back in the Citadel, somewhere, and they'd brought you back too—Chaz! When did you get back from the Mass?"

"A couple of days ago," he said. "Don't worry about that now."

"But you said we were outside!" She tried to lift her head, but he pushed her gently back down again. "I remember now, they put me out. I remember . . . I caught the Rot. Chaz—now you'll catch it."

"Easy," he told her. "I'm not going to catch anything. And as for you, you aren't either—and you haven't."

"But I remember. The fever that starts it . . ."

"Just about anybody," said Chaz, "can whip up a pretty good fever if they're thoroughly convinced they ought to be having one. Hospitals in the old days used to be full of people running unexplained fevers. Feel your throat."

She reached up slowly with one hand and ran her fingers over the surface of her neck.

"There are no ulcers," she said,

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wonderingly. "But I did have sore spots . . ."

"Not only sore," Chaz said, "they were inflamed, too. But you couldn't quite push them over the edge into real ulcers."

"Why," her voice was still weak, but it was beginning to be indignant, "do you keep talking like that? Do you think I wanted to catch the Rot?"

"No, but you thought you would anyway, because you'd lost your witch-immunity."

She stared at him with eyes that seemed half again as large as usual in the aftermath of her sickness.

"I hadn't?"

"Think about it," he said. "Just lie there and take your time. Think about it."

She lay still. After a second she pushed a hand in his direction. He took it and held it; then looked down at it in a mild sort of surprise at himself for understanding so immediately that that was what she wanted. They sat for a little while. It had been chilly again; and with Red Rover already having visited here, secrecy seemed pointless. So he was running a fire in the stove to warm the room. Only the soft noises as the burning wood fell apart broke the silence around them until Eileen spoke again.

"It *was* a psychological block," she said, "my thinking I'd lost my paranormal talents because I'd fallen in love the way a witch isn't supposed to do. I knew it was just a block; but I couldn't seem to do anything about it. But then they put me outside; and in spite of the block, the witch-immunity saved me. It doesn't make sense."

"Sure it does," he said. "I've had the chance lately to make sense out of a lot of things. The instinct to survive is back in the old, primitive machinery of your brain, way behind all that fancy modern wiring that has to do with conscious belief and psychological blocks. What the survival instinct said when you landed outside was, 'To hell with what's haywire up front. We'll deal with the Rot the way we know how; keep her alive and let her figure it all out afterwards.' "

She did not answer him for a moment. Then she spoke.

"Have you got a candle?" she asked. "Anything to make a single, open flame?"

"I've got a lamp," he said.

"Would you light it?" she said. "Leave it where it is. Just light it."

He got up and went to the lamp, which was sitting on the table where he had been working, back in a corner—out of line with the window, just in case. He got the incense lighter and sparked the lamp wick aflame. Such was the dullness of the day outside and the shadows of the corner where the table sat, that a visible brightness was added to that part of the room.

"Come back here now," Eileen said. He came back and sat down on the bed with her, again. "Hold my hand again."

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He took it in his own. She lifted her free hand slightly from the blanket and pointed a slim forefinger at the burning lamp, speaking softly:

"Tiny oil flame, little light,
Wax and grow; make pictures bright . . ."

Watching the burning lamp with her, Chaz for a moment saw no difference about it. Then he became aware that its flame was lengthening, stretching up toward the plaster ceiling. It stretched amazingly, broadening and becoming more blue, less yellow as it did.

It seemed no brighter to look at; but it was doing tricky things to the shadows in that corner of the room. They seemed to shift and mold themselves into forms, even while a sort of general illumination sprang up around them, painting out the familiar dimensions of the corner itself. Unexpectedly—Chaz could not tell when the shift actually occurred—he was no longer looking at the corner of the room at all, but at some sort of tropical beach where two people were running along side by side on white, hard-packed sand, just beyond the reach of the curling waves. The two people were Eileen and himself.

"Be a monkey's uncle!" muttered Chaz.

"It's true." Eileen sighed with satisfaction beside him. "I've got it all back. That's a scene out of our future, darling; and it's going to be all right."

Chaz reached out mentally for the Mass, suddenly realizing he was no longer blocked off from it, and with its aid opened his mind to the more extended logic-chains that might reach to the future scene Eileen said she was picturing with the candlelight. But he could not find that particular scene, himself. Maybe it was somewhere way up there, lost in the unimaginable number of possible futures; but he could not find it. Of course, hadn't she always said her talents were greater than his? And for that matter, hadn't she proved it by blocking him off, first from herself and then from the Mass?

On the other hand, wasn't there the possibility that what she was evoking was not a true picture of the future, but a picture of what she hoped the future would be like?

"It's one of the first things little witch-girls learn," she was saying now, "to charm a candle flame and make it show pictures."

"Yes," he said.

Later on, just as the day dwindled to its dull close with the pasty face of the clouds glowing bloodshot for a moment on the horizon, a voice called unexpectedly from just below them, in the lower story of the house.

"Red Rover!" it shouted. "It's me, on my way up. Don't shoot."

There were the sounds of boots on the stairs again, ascending this time; and Red Rover walked in, to drop uninvited into the room's single large chair.

"All right," he began. "I—"

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He broke off, looking at Eileen, who was sitting up in bed. He bounced to his feet to cross over to her, peered down into her eyes and looked at her neck.

"Well, you were right," he said, glancing at Chaz. He looked back at Eileen. "You're immune."

"I always was," she said.

"Don't act so flip," Rover said, deep in his throat. "There're lots of poor people who prayed to be spared once they were outside here, and weren't."

"Maybe they could have been, though," Chaz said.

"What do you mean?" Rover turned on him.

"I'll show you. Pull your chair up to the table here." Chaz beckoned him into the corner where the table sat. Rover obeyed. "I've fixed you these."

Rover looked at the pieces of paper with the *x*'s, *o*'s, and squares drawn on them. Chaz began to turn them over so that they were blank side up.

"What about them?" Rover asked.

"I want you to try to pick out all the ones with one kind of symbol from the rest," Chaz said.

"Oh, that rhine-stuff," Rover said. "In my neighborhood there were a lot of games like that around. I was never any good at them."

"You hadn't been exposed to the Rot then," said Chaz. "When you were, something like this stopped being a game. Your life was at stake. Since then, things have changed for you. Try it now."

Rover grunted, but bent over the slips of paper—now all blank side up. He fingered around among them; and after a minute had twelve slips pulled off to one side.

"By the way," he said, looking up at Chaz. "How many did you say there are of each kind?"

"I didn't say," Chaz answered. "Does it matter?"

Rover shook his head.

"Not if I'm right," he said. "Take a look. I ought to have all the circles. Funny . . ."

Chaz turned over the slips that Rover had pulled aside. They were all marked with the *o*. He turned up the rest of the slips. There was not an *o* among the symbols marked on them.

"It's funny, all right," said Rover, frowning at the slips. "I was never any good at those games—never, at all."

"Because you didn't expect to be then," Chaz said. "Just like the four men who stayed in this house before us. They expected the Rot to kill them, and it did; just like you expected to lose, and did."

"Why don't I lose now?"

"Because now your survival instinct has found out you can do something if you want to," Chaz said. "When you were first put out, you must have wanted revenge on whoever or whatever put you out so badly that you didn't spend any time worrying about dying from the Rot."

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Red Rover nodded slowly. For a moment his face shifted and became faintly savage, then smoothed out again.

"Yes," he said, "that was about it." He looked up at Chaz. "But that still doesn't explain the how of this . . ." He waved at the slips of paper.

"There was a way open your mind could use to keep you alive, if it wanted to," Chaz said. "As I was telling Eileen earlier, the survival instinct's a pretty primitive mechanism. It doesn't much care about attitudes, or ideas, or really about anything at all, except not dying. When your mind saw a way to keep alive, the survival instinct made it take that way."

"Which was what?"

"You had to believe that you had the paranormal power to defy the Rot," said Chaz. "That's what used to puzzle me. The Rot's not like a microbe or a virus. It's simply a mechanical thing. The spore finds human lungs a good place to flourish; and it keeps growing until it strangles the person it's inside. Of course, there couldn't be any kind of natural resistance to being choked to death. The Rot had to mean one hundred percent deaths following spore inhalation—there couldn't be any immunes."

"But there are," said Red Rover.

Chaz nodded. "Myself, the witches—there'd probably be others around in the sterile areas who'd show they were immune if they were ever exposed to the Rot—but they take care not to be, just like everyone else, because they don't know yet that they're immune," Chaz said. "The point is, though, both the witches and myself know we've got paranormal powers. The four buried downstairs didn't, or didn't believe they had. But obviously you must have, whether you knew it or not. The paranormal powers must have a way of killing or destroying any spores inhaled. You were probably concentrating pretty hard on killing somebody, I'd guess, that first year or so you were outside."

"Yes," said Red Rover. He took a deep breath and sat back in his chair. "But now that we know about me and those powers, where do we go from here?"

"We'll get to that," said Chaz. "But first you've got a few things to tell us. To start off with, how did you happen to come here hunting Eileen?"

"I was working for the Citadel," said Rover. "I didn't know she was an immune, of course, or I'd never have taken the job—either that, or I'd have let her know right away what I was doing. But they hired me to tail her until she was dead, then come back and tell them about it."

He looked over at Eileen.

"Sorry . . . Eileen, isn't it?" he said. "But one of the ways I've made a go of it out here has been doing jobs for the Citadel. If you knew—"

"It happens I do know about working for them," said Eileen. "Don't apologize."

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"Just how have you been making a go of it?" Chaz asked. "And how much of a go was it?"

Rover told them. He had been a member of a trade rare in present times—a high-rise construction worker. As a result, he had been required to work outside of the sterile areas on those rare occasions when construction or repair was being done in the Chicago area. When he had come back inside from work one day, a routine check had shown his sterile suit to have a leak in it. He had not even been allowed back through the inner air lock to gather his possessions. He had simply been turned loose as he was.

He had been filled with fury at the people who had locked him out. For a year he had lived any way he could outside, with only one thing on his mind—getting back in and getting his hands on the inspector who had ordered him left outside. At the end of that year, he had suddenly realized that he knew nobody else who had survived the Rot more than a few months once they had been exiled.

At that time, there were other exiles who had some idea of how long he had been outside; since he had never made any particular secret of it. He got word that some of these were beginning to wonder about him. There were rumors that he was a spy from inside, who had some secret drug to keep him safe from the Rot. He learned there was talk of torturing him until he shared the drug and its secret with the rest of them.

He slipped away and holed up, kept out of sight of anyone else for three months to make sure all who knew him were dead. Then he painted himself with imitation neck-ulcers and began to mingle with the new crop of exiles that had grown up.

There were no further questions about him; until one day when he ran into a pack of Rovers—as the loose associations of exiles were called—those who banded together to make easier the search for food and shelter until the Rot got them. The leader of this particular pack, however, was a man Red Rover recognized from a year before—and who recognized him in return. They got together privately and there was a grim moment in which Red Rover thought it was a case of kill or be killed. But he learned then that while immunes were rare, they were not unknown—to other immunes, that was. Only, it was unwise for them to band together, for fear of being identified by the other exiles for what they were. Also, there was an advantage in each leading his own Rover pack and getting the best of what the pack could provide.

Nonetheless, the immunes kept in touch with each other. It was through the others that Red Rover had learned that the Citadel had jobs for exiles willing to work for it, and would pay for that work in food or comforts impossible to find outside. Most of the work involved trans-

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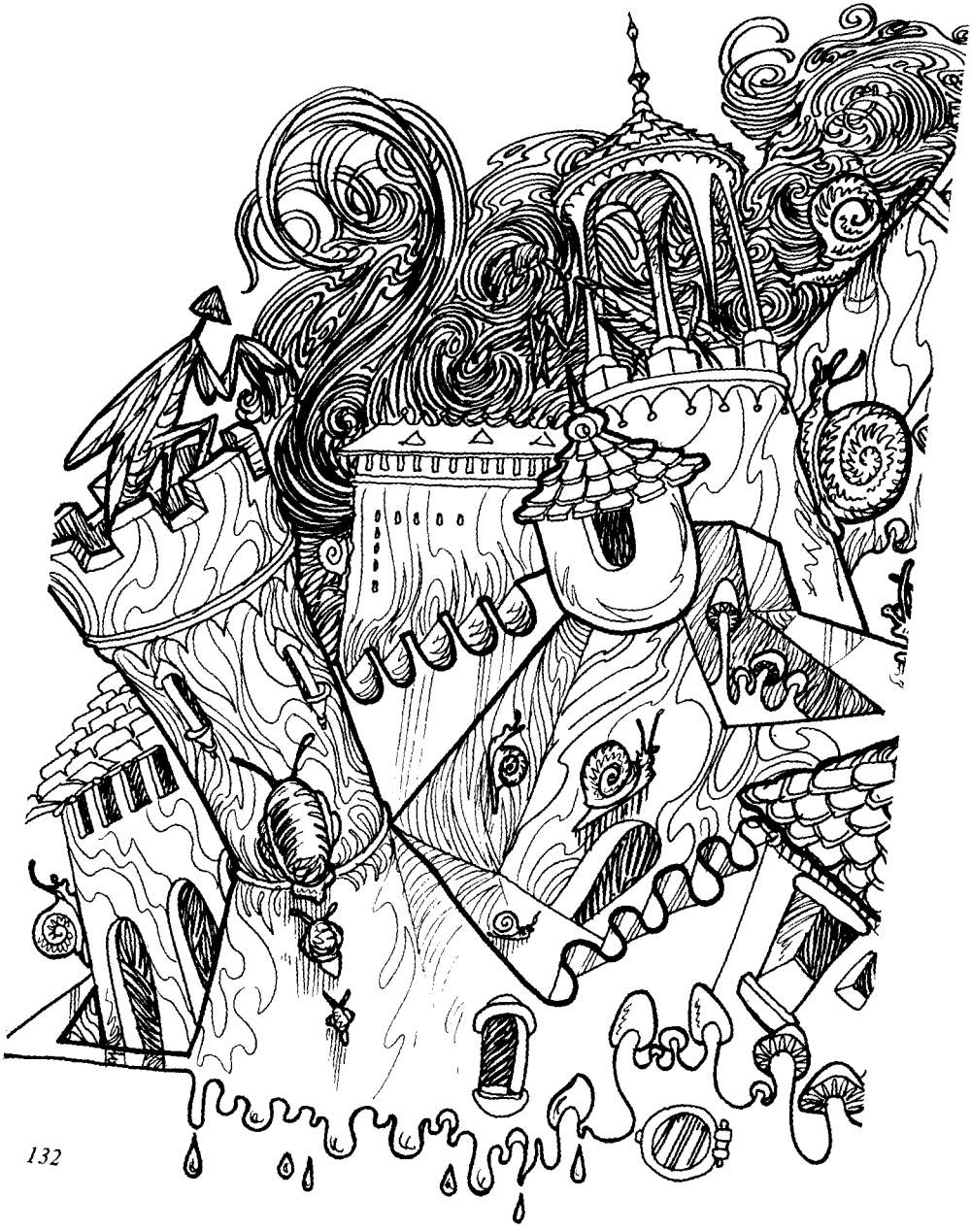

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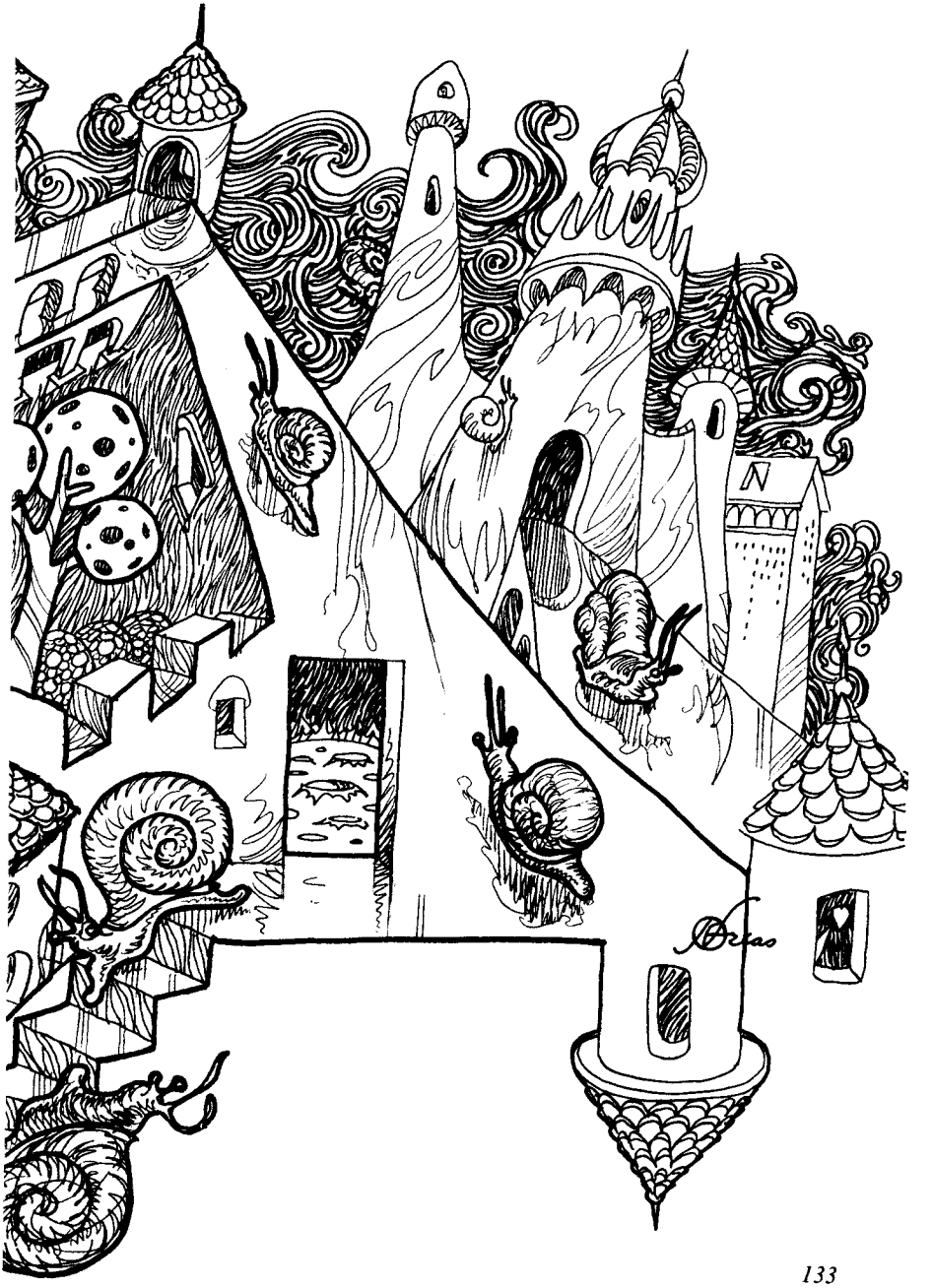

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porting stolen or illegal goods by outside routes from one sterile area to another. Nearly all the exiles working for the Citadel at any one time, Red Rover told Chaz and Eileen, were immunes–although the Citadel was never allowed to find this out. The immune exiles were bitter about all the people still safely in the sterile areas–but most of all they hated the Citadel representatives, who treated them like men and women already dead.

"All right," said Red Rover, winding up his story. "What about you two?"

Chaz told him. It took the better part of an hour to cover the whole story with explanations, from the day of the train wreck until now. Chaz wound up by showing the other the diary of the four dead men. When he had skimmed through it, Red Rover sat for a moment with his legs still outstretched, then gave a long whistle and got to his feet.

"So. Four ordinary dead, instead of one immune; and I helped keep the place untouched for whoever came next. Well, so long friends," he said. "The best of luck to you both."

"You're leaving?" cried Eileen.

"Right!" said Red Rover. "You people are in too deep with too many large-sized enemies for me. I just want to keep alive–I don't even hate that inspector that put me outside, anymore."

"Just walking out isn't going to cut you free of us now," Chaz said.

"Hm-m-m," said Rover. "Maybe you're right. I'm sorry, friends–" His hand slipped in underneath his sweater at his waist and came out holding a hand laser, pointed at Chaz. "If it's got to be a choice between you or me, maybe I better just turn your bodies in."

Chaz' spine prickled; but he kept his voice steady and did not move from where he sat.

"Don't throw away the best chance you've had in years," he said. "You need us a lot worse than we need you. Don't tell me you like living outside that much. I'm ready to bet you'd do just about anything for the chance to get back and be part of human society again."

Rover stood holding the gun, but he did not move his finger on the firing button.

"All right," he answered. "Tell me how I can do that. But it's going to have to be something good. As I see it, you're both right up against the Citadel; and the Citadel's the most powerful thing there is, nowadays."

"No, it isn't," Chaz said. "The Pritcher Mass is. Whoever controls that, controls everything."

"Thought you told me the Citadel already has control of the Mass?"

"It does," Chaz said. "That's why the Citadel's got to go."

"Go? There's nothing that can touch the Citadel," said Rover.

"Yes, there is," replied Chaz. "The same thing that can always touch whoever's in power, and bring them down."

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"Oh?" Red Rover looked at him sardonically.

"People," explained Chaz. "Lots of people. All or most of the people, in fact. Tell me something, Red Rover. Suppose the people in the sterile areas of just the Chicago district were given a choice—face the outside and the Rot, or get rid of the Citadel. Which do you think they'd take?"

Red Rover put his laser away.

"Man," he said to Chaz, "you pushed the right buttons. If you're talking about what I think you're talking about—which is facing all those meditating, prayer-pushing fat hypocrites in the sealed areas with the same sort of thing I've been facing for five years—you've made your point. I want to see that happen no matter what comes, if I have to die for it."

XIII

Red Rover came back and sat down.

"All right, then," he said. "Now tell me how you're going to shove a choice like that on the insiders—and that better be good, too. Because if anyone else out here knew how to do it, it would have been done by now."

"That's one of the things I'm counting on," Chaz said. "Do you think you could round up enough Rover packs to give us a couple of hundred men who feel the same way you do about the people inside?"

"Depends what you want them for," Rover said. "Anyway, they wouldn't all be led by immunes. There aren't that many of us."

"They don't all have to have immune leaders," Chaz said. "Just so they're willing to do some fighting if they have to."

"You aren't going to be able to raid the sterile areas, and scare the people there into choosing between the Citadel and the outside, with two hundred men," Rover said. "Even if two hundred men could handle about three thousand police—which is about what they've got, inside."

"I don't want most of the two hundred inside at all," said Chaz. "They're just to guard things outside while the action inside is going on."

"Just guard? What about weapons?"

"We'll get them," said Chaz. "Any that are needed."

"You will, will you? You seem pretty sure of yourself," said Red Rover. "All right, if most of the Rover packs are just going to guard, what are you going to use to scare insiders into dumping the Citadel?"

"Explosives," said Chaz. He turned and went over to the table for a sheet of paper which he brought back and handed to Rover. "I'm no artist, but that's a rough sketch of the sealed areas of Chicago as I know them. It looks to me as if eight large holes blown in the walls and tunnels I've marked would open up better than half the city to the outside and the Rot spores."

"It might," said Rover, studying the sheet. "But you've got to be talk-

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ing about *big* holes. Holes you could walk a whole marching band through. And that's going to take something like you've never seen in the way of explosives. The few sticks of old dynamite or blasting powder we can scrounge up here on the outside won't begin to open even one of your holes."

"Don't worry," Chaz said. "We'll get the explosives from inside. All we need, just like with the weapons."

"From where?"

Chaz nodded at Eileen.

"The covens will help."

"Covens?" Rover echoed, looking at her.

"Witches get together in covens," Eileen said from the bed. She was beginning to get some normal color back in her face, after the drawn look that the fever had given her. "Something like Rovers get together in packs. I'm a witch."

"Witch?" said Rover. He blinked at her. "You don't mean . . . witch?"

"Why not?" said Eileen, smiling a little wickedly at him. "You're a witch, too--or as good as. Remember what you did with those pieces of paper just now? Otherwise you'd never have been immune to the Rot. Why? You aren't prejudiced against witches, are you?"

"Well . . . of course not," said Rover. "I was just thinking, that's all. It's the other Immunes. What I mean is, maybe we better not rush them. Suppose I just start talking about some people inside who're against putting out every poor wonker who might have breathed unsterile air for a minute." He became brisk. "Now, how do you plan to do this?"

He turned his back to Chaz.

"Eileen knows where the Citadel people are—in a building actually called the Embry Tower," said Chaz. "Some of us attack that at the same time as one hole is blown in a single sterile area, as a warning. Meanwhile, another bunch—the witches, maybe—have gotten their hands on the city's emergency channel on the viz-phones. They cut in on the general alert following the explosion, and broadcast a warning that the rest of Chicago gets opened up unless the Citadel people are handed over to the outsiders. Then they switch to phoning pictures of us taking over the Citadel building and also to filming the mobs that form to help us."

"And what," said Red Rover, "will the Chicago District Government and police be doing while all this is going on?"

"You ought to know better than that," Eileen put in from the bed. "The Citadel owns the Chicago District Government. The District Director, the General of Police, and nearly everyone else that counts, are Citadel members—just like with every other large city district in the world. In fact it's not just Chicago. The whole world, more or less, is run from that Citadel building."

Red Rover grunted, as if someone had punched him in the stomach.

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"Want to back out?" Chaz asked, watching him closely.

Rover shook his head.

"I guess you want our Rover packs to guard the explosive positions outside the walls and tunnels then," he said.

"That's right," Chaz said. "And set them off only when ordered—if ordered—by you. We can't trust anyone else outside."

"That's true enough." Without actually moving, Rover gave the impression of shaking himself off, like someone coming up into the air after a deep dive underwater. "Now what?"

"Next," Chaz said, "we get together with the covens. Eileen contacted one of the witches in her own coven, this afternoon. The whole coven will get us inside and meet with us, as soon as we can come in. What's the closest air lock to the Chicago District?"

"About five miles east," Rover said. "There is a trash disposal lock. We can walk it in a couple of hours. Night's the safe time to move around—if Eileen there's up to it. I've got a portable limpet light."

"I'm up to it," said Eileen.

It was actually closer to four hours before they all sat together in a witches' hole in the sterile areas with those members of Eileen's coven who could be gathered together on such short notice. Noticeably among the missing were the Gray Man and one or two others not trusted by the coven.

Chaz introduced Red Rover and once more explained his plan.

"You know," said a white-haired man among the witches, "we're not fighters; and we've got a responsibility to protect the sisterhood and the brotherhood. But we could get your Rovers anything they need—it's our people, not the Citadel's, who control the supply tunnels. And we can probably dig up some of us who know something about the use of explosives for demolition and things like that."

"How about people to man the phones and get what we're doing on the viz-screens?" Chaz asked. The white-haired man hesitated.

"Maybe some of the younger ones might want to take an active part in that end of it," he said. "We'll know after we check with the other Chicago covens. That'll take several days. Now, about payment for our part in this—"

"Payment!" said Red Rover. The word came out of him with the abrupt, brutal sound of an obscenity.

"I'm sorry," said the witch, looking from Rover to Chaz. "But as I say we've got to protect ourselves and the next generations of witches. That's been our rule down the centuries."

"Damn you," said Red Rover. "This isn't the Middle Ages anymore. You're some sort of psychological types it says in the textbooks, not bogeymen."

"I'm sorry," the white-haired man said again. "But we can't suddenly

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scrap the rules that we've lived by this long." He kept his gaze on Chaz. "When the Citadel's influence is cleaned out of the Pritcher Mass, we want the witches to take over control of it. I don't mean control out on the Mass itself; I mean the Earth end of it, the policy and decision-making authority back here. We can't risk having the Mass used against us."

"You sure you can speak for all your friends?" demanded Rover, before Chaz could answer.

"Sure enough so that I know there's no use going to them for help unless you can promise what I'm asking," the witch answered without taking his eyes off Chaz. "Well?"

"Well . . ." said Chaz, slowly. "I'll agree—provided one thing. No one with paranormal talents is to be excluded from the witch group that gets control of the Earth end of the Mass."

"That's reasonable enough," said the witch. "All right. We'll get busy."

Arrangements were made for delivery of explosives and other supplies to the Rovers by the witches; and the meeting broke up. Chaz, Eileen and Red Rover were let back outside by the same way they had entered, through the service air lock by a waste-disposal outlet. With dawn only a few hours away, they headed back to the house.

"What makes you think you can deliver control of the Mass to anyone, once this is over?" Red Rover asked Chaz bluntly. Chaz looked at him in the illumination from the limpet light the other man was carrying.

"Do you trust me?" Chaz asked. "Or don't you?"

"Oh, I trust you," Rover said. "I'll also look you up afterwards and kill you, if it turns out trusting you was the wrong thing to do."

It took better than a week—both inside and outside the sterile areas of Chicago—to set things up. In the meantime, Red Rover left a note just outside the air lock that was his contact point with the Citadel, saying that Eileen had died of the Rot. Two days later, checking the point from under cover, he saw the red piece of cloth lying on the ground that was the signal that he was wanted. He waited until after dark, went in without a light and found an answering note. He took it a safe distance away over a hill to use a light on it, and read that he was to produce Eileen's body and bring word of the location of a man answering Chaz' description. Dousing his light, he carefully took the note back and left it where he had found it, by the red cloth. From then on he stayed clear of the contact point.

Meanwhile, however, the covens had picked up word that the top people in the Citadel organization were returning from around the world, and even from the Mass, to meet at the Citadel building in Chicago. An unhappy and fearful male witch slipped outside the sterile areas to bring the news to Chaz, personally.

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"I expected it," Chaz told the man. "They've got the Mass and, as Eileen herself reminded me once, people with paranormal talents and computers. They can follow logic-chains well enough to see that I'm going to try something against them. Naturally they're getting together to plan strategy."

"If they know that much," said the witch, "they may know just what we're planning to do. They can be waiting for us."

"They don't know," Chaz said. "They can't predict correctly without having all relevant facts. And they don't."

"What don't they know?"

"Certain things," said Chaz. "For one, that there are immunes among the exiles; and that these immunes owe their lives to paranormal powers they didn't even suspect they had."

The witch stared at him.

"What else don't they know?" he asked at last.

"Some things," Chaz said. "I'll tell you what your people can do, though. You can pull out of this if you want to. Only, if we lose, the Citadel is going to trace those supplies back to help from your covens; and if we win, you won't get the authority over the Pritcher Mass you wanted."

The witch left. But there was no talk from the covens of withdrawing their assistance in the few days that remained.

The attack on the Citadel had been planned for a Sunday afternoon. At three that afternoon, Chaz, Eileen, Red Rover and a dozen of the Rovers, about half of them immunes, were waiting in the supply tunnel that connected with the Citadel building. Chaz was carrying a portable phone to the cable in the tunnel wall; and he had it keyed to show the southern face of the building and the sky over the western section of the Lower Loop sterile area of Chicago. The view was from the pickup of a public phone booth of a square before the south side of the building, which was listed in the District Directory simply as the Embry Tower. It was one of the eighty-story towers raised in that part of Chicago in the 1990's, shortly before the Rot had appeared. It poked its top thirty stories through the upper protective dome over the sterile area like a stick through a bubble; and its outer glass facing reflected the gray clouds overhead with a matching grayness of its own. There were only a few casual pedestrians crossing through the square at the moment. Half a dozen nonuniformed guards could also be seen playing the part of casual idlers, within the transparent walls of the street-level lobby of the tower.

"There!" said Chaz; and the rest of those with him crowded closer to the small phone screen for a look. A black plume of smoke was rising toward the clouds off to the west beyond the tops of the area's buildings, in that direction. A second later, the

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tunnel about them shuddered slightly with a shock wave.

The scene on the phone screen was suddenly replaced by the picture of a middle-aged, heavy-featured woman wearing a green police uniform. The sharp warning whistle of the emergency signal sounded. If Chaz' phone had not already been in use, that signal would have activated it.

"Citizens of the Lower Loop area," said the woman on the screen. "Emergency. I repeat, this is an emergency broadcast under the pollution warning system. All citizens of the Lower Loop area, please pay special attention. All citizens of the nineteen sterile areas of the main Chicago District, pay close attention. An as-yet-unexplained explosion has breached the seal in the western extremity of the Lower Loop area. All available pollution-fighting equipment has been called in from all nineteen areas; and a chemical barrier is being thrown up while a temporary seal is under construction behind the exposed area.

"All citizens are warned to stay where they are, if possible, and preserve local sterile conditions. Please, those of you who may have relatives or friends in the area of the explosion, stay away. Repeat, *stay away!* Crowding the access routes to the area will only increase the danger of polluting the whole Lower Loop. All care will be taken to insure that those not exposed will not be left beyond the temporary seal when it is locked in place. I repeat, do not crowd the area. All care will be taken—"

The image of the woman in the uniform was suddenly wiped off the screen, to be replaced by a figure of an ordinary gray jumpsuit wearing a flexmask—and it was impossible to tell from the screen whether it was a man or woman. The accompanying voice was similarly disguised by a filter, so that the anonymity of its sex was complete. It was one of the witches, Chaz guessed; but which one, probably even Eileen would never know.

"Attention, citizens of all Chicago sterile areas," said the figure. "Attention, all Chicago citizens. The explosion just announced by pollution control authorities was not an accident. I repeat, not an accident. The security of the Lower Loop areas has been deliberately breached as a warning to Chicago citizens. All other areas in the main Chicago district will be similarly breached, and the citizens now in them exposed to the Rot spores, if the members of the criminal organization known as the Citadel, who are now occupying the Embry Tower in the Lower Loop, are not immediately removed from that building and put outside the sterile areas.

"I repeat. The members of the Citadel now in the Embry Tower must be removed and placed outside the sterile areas. They must be put out at the spot where the Lower Loop was just breached, before sun-

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set, or the other areas of the main Chicago district will be breached in a similar manner. We, the Committee for the Purification of Chicago, call on all citizens to assist in securing these criminals and seeing that they are put outside.

"I will repeat again what I have said. The breach of the Lower Loop area was not an accident. Other areas will be breached unless the criminals of the Citadel are removed from the Embry Tower and placed outside by sunset. We, the Committee for the Purification of Chicago, call on all citizens to assist in securing these criminals . . ."

"Let's go," said Chaz, turning from the phone to the door nearby, leading into the basement of the Embry Tower. He fitted a vibration key to the lock plate and the heavy door swung open. Inside, in a small room at the foot of the concrete staircase, were three uniformed guards—all sound asleep in chairs.

Chaz grinned at Eileen. The tension of the moment already had the body adrenaline singing in his blood.

"Beautiful, honey," he said. "I had to see it to believe in it—a spell cast through a cased steel door."

"You ought to know physical barriers don't—" Eileen broke off, glancing up the empty stairs. "Chaz!"

"What's wrong?" He swung about to stare at the harmless-looking stairs.

"Power," Eileen said, unhappily. "Someone with a terrible lot of power, up there somewhere. Can't you feel it?"

Chaz tried, felt nothing, reached for help from the Mass, tried again and still felt nothing. He shook his head.

"You mean somebody knows we're coming?"

"I . . . don't think so," said Eileen. "But whoever it is, he's the most powerful person I've ever felt."

"He?"

"I don't know. It just feels male, somehow . . ."

Chaz shook his head.

"Forget it. We can't fiddle around now." He spoke over his shoulder to the rest of them. "Come on."

He led the way up the staircase. At the fire door of the street-level landing, Red Rover snapped to the men just behind him: "Seal that!"

Several Rovers stopped and began to melt the edges of the door into its heavy metal frame with their hand lasers. Chaz continued up the stairs.

At each landing, Red Rover left men at work sealing the fire doors. But four landings up, the staircase itself ended, abruptly and in violation of all fire ordinances. A solid concrete wall barred their way.

"The elevators," Chaz said.

He went through the nearby fire door into what seemed to be a fourth-floor landing. There were some doors opening on the landing, all ajar, all showing small, empty offices. The elevator tubes were there also, but they were halted, their

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floating disks hanging frozen in the transparent tubes.

"Think they expected us, after all?" Red Rover asked.

"Maybe," said Chaz. "Maybe just an automatic protective reaction switched them off when the emergency phone broadcast came on, or the guards down in the lobby found out we were here."

Below them, from the stairwell, they could hear a crackling noise as the lobby guards, alerted by the heat radiating from the half-melted edges of the sealed fire door at that level, were now trying to cut through the door from their own side. Luckily it was easier to seal a door with a laser than to open it with such a weapon after it was sealed.

"What then?" Rover said.

"I thought of something like this," Chaz said. "Eileen's been held in this building before. She's got a memory of the room she was kept in. If she and I can transfer to that room, maybe we can get the elevators going for the rest of you. Give me the recorder and the suit bag."

He reached out; and the Rover with the portable phone recorder, slung like a satchel from one shoulder, lifted it off and passed it to him. Chaz slung the strap over his own right shoulder and turned to Eileen. He took the suit bag another Rover passed him and produced a pair of airsuits, handing one to Eileen.

"What's that for?" Red Rover asked. Chaz did not take time to answer until he and Eileen were both suited up. He watched Eileen close her faceplate, then turned to Rover before sealing his own.

"I'll try taking her out to the Mass and back in again," he said. "It worked in rehearsal, but then we both knew where we wanted to come back to. If it doesn't work this time, take your Rovers back out and mingle with whatever crowd shows up in the square. Give us five minutes, then leave. But keep your portable phone open for any word from me. All right?"

"Right enough," said Red Rover.

Chaz reached with his gloved hand for Eileen's. He winked at her through his faceplate, in signal. These particular airsuits had no phones.

The landing around them blinked out. There was a glimpse of starlight and the Mass platform apparently standing up vertically alongside them to their right, then they were in what looked like an ordinary, condominium one-room apartment.

Chaz looked at Eileen. She was nodding and smiling through her faceplate as she unsealed it so that he could hear her speak. He reached up and unsealed his own.

As he pulled it open to the room air, a sudden dizziness took him. He opened his mouth to shout a warning at Eileen; but saw her with her own suit unsealed and already falling. A moment of disorientation took him and . . .

He opened his eyes to find himself

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out of the airsuit entirely and seated in a chair.

Eileen was seated in a chair alongside him. They were under the dome of a roof garden—almost certainly on the top floor of the Embry Tower. Facing them were several tables pushed together to make one long surface; and behind this sat a small handful of people, among whom Chaz recognized Waka, Ethrya, and Jai.

Beside Chaz, Eileen made a small, choking noise. He looked quickly at her, and saw her staring at Jai in either fascination or terror.

"You?" she said, in a strangled voice. "You're the one I felt downstairs?"

"Yes," said Jai. "And thank you, sister. I take the recognition as a compliment. You seem to have more than an ordinary share of the talent, yourself."

XIV

Chaz throttled back the dismay and fury that rose inside him. It was strangely easy to do.

"You're one of the Citadel crew too, then," he said calmly to Jai, "or maybe you're their head man?"

"No one in the Citadel is head man," answered Jai. "We're like any other business, an organization. You might compare me to a chairman of the board, if you want to make a comparison. Ethrya, here, would be president of the company, perhaps."

The tall man's voice was as gentle as ever. Chaz shook his head a little.

"What could an outfit like this offer someone like you?" he said. "Particularly if you've got the paranormal abilities Eileen says you have."

"Freedom," said Jai, gently. "Some people find freedom by getting well away from others. I find it by being well in control of others." He looked at Chaz almost sadly. "That's always been your one flaw, Chaz. You don't have the drive to control others; but at the same time you refuse to let others have any control over you. That's why I've finally voted against you; even if I was for your coming out to the Mass, originally."

He glanced to his right at Waka.

"Not everybody agreed with me about that," he said. "Poor old Alex, here, was caught in the middle."

"Why take chances?" Ethrya said. "It was a real chance you took when you had Waka qualify him for the Mass. If we'd killed him in the first place the way *I* said, he wouldn't have been around to cause us even the trouble he's causing us now."

"Investment theory," said Jai. "The whole theory of investment assumes some risk-taking in order to get the chance of making a greater profit. Chaz might have paid off for us very well. Besides, the present situation is under control."

He looked away from Ethrya, over to one side where a couple of men were setting up two antennae, each about three meters tall, and two

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meters apart. For a moment they stood there unenergized, like silvery wands; and then a two-dimensional image sprang into being between them. It was a view of the square before the south side of the Tower, apparently picked up by a camera high on the building's side, but telescopically enlarged to give close-ups from what seemed to be a few feet above the heads of those in the square.

Meanwhile, people behind the long table section were changing seats. Ethrya was giving up her chair beside Jai to a heavy-set man in his fifties with a bulldog face; a man who looked vaguely familiar. Chaz stared at him for a moment before it registered on him that he was looking at the City Director for the Chicago District. Eileen had been right about the Citadel's involvement with government officials.

Chaz looked back at the scene in the square below. *Think,* he commanded himself. The square was beginning to fill up with a crowd that was clearly disturbed and unfriendly in its attitude toward the Embry Tower. Chaz glimpsed several of the Rovers he recognized, wearing ordinary jumpsuits, circulating among the crowd and clearly talking its emotions up. He did not, however, recognize Red Rover anywhere; and the absence of the immune leader brought him a small, unimportant feeling of relief. He remembered Eileen, and looked over at her.

She was sitting in a chair just like his, not more than three meters from him. She smiled a little palely, as their eyes met. Like him, she was not tied in the chair or restrained in any way; although, looking beyond her, out by the far end of the long table surface he saw a thin young man covering them both with a hand laser.

Chaz turned his head back to the table.

"Jai?" he said.

The tall man broke off a low-voiced conversation with the Chicago City Director and a short, white-haired man standing behind them. The white-haired man turned and went off to take a chair several seats down the table to Jai's right. Jai looked at Chaz. Chaz had to think for a second. Then he remembered why he had called the tall man.

"Eileen," said Chaz. "You don't need her here."

Jai shook his head.

"To tell the truth, I'd like to do without her myself," he said. "After all, I'm a witch, too—or was. And hurting any kind of people is a bad practice. It builds up calluses on the sensitivity areas. But in this case we have to make a case against you, Chaz; and we need her for that. A shame—" he glanced at Eileen for a moment. "You really do have an unusual talent, sister."

"Don't call me sister," said Eileen emotionlessly. "You don't deserve the name of witch, if you ever did. *Dark see you, dark blind you, grave take you, curse bind you."*

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"I'm sorry," said Jai, very gently indeed. "I understand how you feel. But you ought to know better than to think you can hurt me in any way with the Craft. In all my life I never found anyone who could approach me at its use; much less one able to attack me with it."

He turned back to talking with the mayor. In the screen, the square was now showing itself packed with people; and to the west the dark stain of smoke from fires following the explosion still hung like a dirty finger-smudge on the sky above the city's buildings and transparent domes. It was getting on toward four o'clock, Chaz guessed; and the gray-clouded winter day, as it always did at this hour, had become dull-lighted and heavy with a chilling dreariness. Something inside him was telling him that the battle was already lost. Lost and forgotten . . .

A bit from a poem floated out of the back of Chaz' attic memory into the front of his mind. What was it from? Oh, yes . . . "La Belle Dame Sans Merci," by John Keats:

"Ah, what can ail thee, knight at arms,
Alone and palely loitering?
The sedge has withered from the lake,
And no birds sing! . . ."

And then, the last line:

". . . La Belle Dame Sans Merci hath thee in thrall."

Only it was not *La Belle Dame,* but *Le Beau Jai,* that had Eileen and himself in thrall . . .

Faintly, from a sound receiver somewhere, he heard a chanting. He looked at the image of the square below, and saw the crowd swaying back and forth as one person. Obviously, it was the source of the chanting, which was directed against the Embry Tower; but the receiver was set at such low volume he could not make out what words were being chanted. The sound and swaying stopped then, almost abruptly; and the camera view swung around to look awkwardly down at a narrow angle on the lower front of the building itself. On the lower building-side there was now showing an image of the long table and those seated behind it; with the central focus on the face of the Chicago District Director. He began to speak. Someone turned the volume up on the receiver and it echoed his words as they also reached Chaz' ears from directly across the little distance between Chaz and the long table.

". . . realize that it is unusual for myself, as District Director, to address you all over an emergency phone broadcast this way. However, we are presently faced with a situation in which the utmost in self-restraint and control will be needed from all our citizens. As most of you already know, saboteurs from outside the sterile areas have succeeded in blowing a hole in the protection of the Lower Loop. As anyone might

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expect, we neither judge nor condemn these sick-minded exiles from among those who have had to be removed from the sterile community for the greater good of all. But for that same greater good, we must now take defensive measures to protect our healthy populace. In order that all Chicago citizens should understand the need for such defensive measures, I have felt it needful to acquaint you not only with a plot that has already resulted in one explosion, plus the threat of others that would indeed pose a danger to us all, but also to acquaint you with the chief saboteurs and events leading up to this criminal act."

He paused, glancing at the image of the square below. Chaz also looked. Judging from the reaction of the crowd, most of them were paying attention. It was a good bet, thought Chaz absently, that all through the Chicago areas, most of the others there were listening as well.

"These saboteurs," the Director went on, "have attempted to blackmail you all into exiling some perfectly innocent and valuable members of the sterile community. Their aim in this was to cripple a scientific project which is dear to the spiritual and ethical hopes of all our people; in that it offers hope—not to us, but to some chosen few of our children—who with its help may one day find a new Earth on a clean, untouched world; and by avoiding the mistakes of our profligate ancestors, set the human race once more on its upward road.

"But before I say any more, let me take a moment to reassure everyone that our police, acting on information supplied by citizens who were approached by the saboteurs but who took their information immediately to the authorities, have located all four of the other explosion sites prepared by the saboteurs—"

"That can't be right," said Chaz out loud, without thinking. "No one inside the sterile areas knew the number or location of the other sites; and only one man outside, besides myself, knew until three hours ago."

"I will now give you Police Headquarters on remote for a report by the Police General himself," said the Director hastily, and sat back in his chair, turning to Jai. "Did they hear him?"

Jai looked past Chaz. Chaz, turning, saw a red-haired, bulky man at a small table bearing commercial-sized broadcast recorders. The bulky man shook his head, and walked up, past Chaz, to the table.

"No chance," he told Jai and the Director. "I've got his chair in a dead zone. I can feed him into the screen with a directional pickup any time you want; but outside of that, he's simply not here to the rest of the equipment."

"How long are you giving the Police General?" asked the Director, looking at his watch.

"Four minutes," said the bulky man. "Then we return to you and you do the introduction to the Assis-

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tant Director from the Mass, here." He nodded at Jai. "While we've got a moment, though, Mr. Director, if you'd move your chair a little closer to the Assistant Director's, it'd help in the reaction shots. We want to close in on your face, looking concerned, when he makes his more important points. He'll hold up one forefinger to signal us; then I'll signal you, Mr. Director, and you listen for the line you want to react to . . ."

Chaz let his attention drift from the conversation at the table. He looked at Eileen and smiled; and once more she managed a smile in return. The thin young man covering them with the laser continued alert.

Chaz' mind had been working slowly with the situation, trying to lay out logic-chains on the possibilities. But he found himself unable to hold the chains in his mind. It was hard to concentrate in the face of the realization that everything was all over. For himself, he thought, it hardly mattered. Nobody would mourn him after he was dead; and as for the dying itself, that hardly mattered more to him than his death would to anyone else. He had been something like a cornered rat in his reactions all his life; and in a way he had always been prepared for the time when the rest of the world would turn on him and destroy him. He knew that whenever his own time came he would go out in a red rage, which was not the worst way to die, no matter what was being done to you at the time. But of course, there was Eileen. Jai was clearly planning that she should share whatever conclusion was in store for Chaz; and she would not find dying such an indifferent matter as he did—especially if it was some kind of prolonged death.

He looked at the man with the laser and put his hand on the edge of the chairseat, under him. Maybe by throwing the chair at the thin young man he could distract the gunman long enough to reach him and get the weapon away. Then he might be able to live long enough to shoot Eileen. She would not be expecting it and from him; it would be mercifully swift. She would never know what hit her.

". . . Now that you have all heard what the General of Police has had to say," the City Director was talking again, "I want to introduce you to a man some of you may already have recognized in the group shots of this table—Jai Losser, Assistant Director on the Pritcher Mass. To those of you who are surprised to find the Assistant Director of the Mass back here on Earth, I should explain something that has been a closely guarded official secret, and which is revealed now only because of the seriousness of the situation. This building, the Embry Tower, which the saboteurs would have had you believe contained the chief members of the reputed criminal organization popularly named the Citadel, is actually the confidential headquarters on

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Earth for work with the Pritcher Mass. Assistant Director Losser is now going to speak to you because the chief saboteur, whom we have under arrest here, together with the woman who was his first assistant, was himself a worker on the Mass. Mr. Losser."

Jai leaned forward, smiling softly, as the City Director sat back in his chair.

"I'm honored to speak to the citizens of Chicago District," he said pleasantly, "although I wish the occasion was a happier one. The chief saboteur the City Director mentioned is a man named Charles Roumi Sant, formerly employed in this District. A man whom I regret to say I once liked, and of whom I had a very high opinion."

He gestured with one hand toward Chaz. Chaz, watching the image between the two upright antennae, saw his own face appear many times life-size on the south face of the Embry Tower. It showed there only a minute, then was replaced by a brief close-up of the District Director, showing concern on his features, followed by a return to a head-and-shoulder shot of Jai.

"Even now," Jai said. "I hate to condemn this man. Although tests show him to be completely sane and responsible, it is hard to believe that any sane man could plan on exposing hundreds of thousands of Chicago residents to the Rot, simply to gain a position on the Pritcher Mass that would insure his being one of those that would emigrate to a new world—once such a world had been found."

He waved again at Chaz. Once more, Chaz saw his own face flashed on the building. The sound of the crowd voices mounted. Jai's features replaced those of Chaz.

"The details are somewhat technical," Jai said. "Briefly, however, Sant tried to gain a position of authority on the Mass by creating an illusion that he had contacted not only a habitable world, but one with intelligent aliens on it. This hoax was exposed when I went out with him during a shift of work on the Mass, and made mental contact with the illusion myself. While it first seemed to have some validity, a closer examination showed nothing really new or alien about the world or its so-called alien inhabitants. Working with an artist, I have managed to produce actual-size representations of those aliens as Sant imagined them. I have those representations here; and you will be shown them. Notice how they are nothing but a common Earth insect, and an equally common Earth mollusk, enlarged."

He waved his hand to the left side of the table, where Chaz saw two large two-dimensional cut-out sort of figures. One was very much like the Mantis and the other was very much like the large Snail from the cartoon world. He looked back at Jai.

"I didn't know you were with me,"

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he said to Jai. "You actually are good, aren't you? But why drag that part in—wait, I understand. You've got to find some way of justifying what happens to me to the non-Citadel people back on the Mass. You've got to have some reason for shutting off contact with the cartoon world I added to the Mass."

Jai did not answer. He had paused to let his viewers look at the representations. Now, he went on to his audience.

"When I told Sant I knew this was a hoax," Jai said, "he admitted it; but he begged to be kept on the Mass. I was forced to refuse. He came back to Earth. Back here, he went outside the Chicago District and gathered a crew of saboteurs with the idea of blackmailing the citizens of Chicago into creating a threat to this building and its workers. It was his hope that he could use that threat in turn to blackmail us here into putting him back on the Mass in a position of authority."

Jai paused and smiled across the table at Chaz. For a second Chaz saw his own face, looking oddly unconcerned, imaged on the building in the screen between the antennae. Then Jai was back on the screen.

"But we," said Jai, "trusting in the good common sense of our Chicago citizens, decided to call his bluff; with the result that, as the Police General has explained, we have now nullified all his attempts at sabotage; and he, with the woman who abetted him, is now in custody."

Another flash of Chaz' face on the side of the building below. The volume of sound from outside was turned up; and the voice of the crowd was an ugly voice, becoming uglier at the sight of Chaz' image.

"Sant and the woman will now be sent under police escort from this building through the streets to Police Headquarters," Jai said. "You may all return to your homes, satisfied that everything is secure and justice will be done. Please, I beg you, any of you who have strong feelings about what Sant might have succeeded in doing, take my word for it that in our courts justice will indeed be done. Do not be tempted to take it into your own hands . . . "

The crowd roared like a senseless beast.

"I trust you," said Jai, with a sad smile, "your General of Police and your District Director trust you, to allow these criminals and the two police officers who will be escorting them, to proceed in an orderly manner from here to Police Headquarters--"

Chaz rose with a great effort, and threw his chair at the young man with the laser, knocking him down. Following the chair as fast as he could--but it was almost as if he moved in slow motion--Chaz was on top of the gunman before he could recover and had his hands literally on the weapon. But before he could get to his feet a number of people

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were holding him. He was pushed to his knees and the laser wrested easily out of his grasp. He was hauled to his feet again by two men in police uniforms. They marched him back to his chair, shoved him down into it and let him go. He sagged there, feeling too heavy to move.

"Not Eileen . . ." he said to Jai, in dull protest. The sound of his voice roared back at him from the screen; and he realized that he had probably been imaged there ever since he had picked up his chair to throw it at the man with the laser.

Jai came around the table. The handsome face bent down to him; and Jai's voice also echoed from the screen, speaking not merely to Chaz, but to the crowd below as well.

"I'm afraid so, Sant," said Jai, sadly. "Your accomplice, like you, will have to face justice for the way both of you have threatened innocent lives."

Jai smiled gently, regretfully. One of the lines from Keats' poem came floating back into Chaz' mind, with changes: *"Le Beau Jai Sans Merci hath thee in . . ."*

With that, at last, understanding broke through the thick pressure clouding Chaz' mind. Abruptly he realized what was happening; and on the heels of that realization came immediate reaction.

So it was that the red fury he had expected at the end finally exploded within Chaz. It was then, in the ultimate moment, that he went berserk.

XV

But not by the simple, physical route alone. His causes had been larger than that.

They were all he had suffered under, erupting within him at once. The sad hypocrisy of his aunt and cousins, the stifling closeness of domed streets and sealed buildings, the oppression of a race that seemed to sit with folded hands, waiting for its end. All this, plus his own loneliness, his own rebellion, his one gain of someone who actually loved him, in Eileen—whom Jai had been planning to include in Chaz' destruction at the hands of a deluded mob, while Chaz sat by, bewitched out of courage and sense.

Chaz reached for the Mass-on-Earth, as he had found it when he had hung above the platform beyond Pluto, wanting to return to Eileen, on Earth. Once more he touched it and drew strength from it. With that strength, he threw off the dead weight of hopelessness that Jai's Craft had laid on him; as easily as a passing touch of drowsiness could be thrown off when there was work needing to be done. Almost, he had been ready to go to the mob like a lamb to the butchers.

His head woke. It went light and clear; and suddenly things seemed very obvious and very easy to do. Ignoring the thin individual who was again holding the laser on him, he got up once more from his chair—but this time it was everybody else who

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seemed to be in slow motion as they reacted to his moving—turned, and went back to the table with the camera and recording equipment. He brushed the bulky man there easily aside and spoke directly into the equipment.

"Red Rover!" he said. "Blow the other explosive charges. Blow them all, now. Every one."

He heard his voice thunder from the image between the antennae; and caught sight of the man with the laser coming at him, shoving the weapon almost in his face.

"Don't be foolish," he said. "I know you've got orders not to shoot. They want the crowd to get me."

He shoved the thin man away and turned back to the equipment.

"Sorry, people," he said to the people of Chicago District. "But you'd have to face up to the Rot, sooner or later. There are more exiles outside all the time. How long do you think it would have been before they began sabotaging the sterile areas on their own?"

He turned away from the equipment and went back to the long table. It was full of people ignoring him; all talking on the phone, ordering buildings to be sealed, rooms to be sealed, hovercraft to pick them up and carry them away from Chicago. Only Jai was not talking. He was watching the others instead, with a sad, dry smile. But he dropped the smile and turned to face Chaz as Chaz came up to him.

"Why?" he said to Chaz. "What good did it do you? Once those other holes are blown in Chicago's sterile defenses nobody will be able to save you from the people, even if anyone wants to."

"Never mind me," said Chaz. "Don't you understand it's all over? It'll never be business as usual for your group again. Didn't you realize how it was? I could lose; but there was no way your Citadel could win?"

"I don't know what you're talking about," said Jai.

"The Pritcher Mass," Chaz answered. "It can't do you any good, no matter what happens to me. If you were there with me mentally when I went from the Mass to the cartoon world, you have to remember they told us that."

"They?"

Chaz threw his arm out to point at the cut-out figures of the Snail and the Mantis.

"Those?" Jai made a dismissing gesture. "We'll find some other world."

"You'll find—" Chaz stared at him; and understanding, even of Jai, woke suddenly in him. "I'll be damned! You're self-brainwashed, too. In spite of all that paranormal talent and intelligence, you've been burying your head in the sand like the rest!"

Jai looked back down at him with a closed face.

"Let me show you something," said Chaz. He reached for the Mass beyond Pluto—and found the way

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blocked by Jai's mind and paranormal strength. "All right. We can do it right from here."

Chaz turned his mind once more to the Mass-on-Earth, found it, and reached out through it to the cartoon world, to the Mantis itself and the Snail. He found them, feeling Jai's mind with him, watching.

"They don't want to believe it," Chaz said, at once out loud to Jai and through his mind to the Mantis on the cartoon world. "Can I call on you once more to tell them yourselves that the road to any other world is closed? That there's no place we can escape to?"

"This once more," said the Mantis.

The Mass-on-Earth stirred and shifted under the transparent bubble roofing over the top floor of the Embry Tower; and all over Chicago, reality changed. Not for Chaz and Jai alone, but for everyone there. It was a little change, and at the same time, a big change—as if an extra physical dimension had been added, so that there was no longer merely length, width, height and duration; but also *away,* binding Earth and the cartoon world together.

The Mantis and a Snail appeared over the city along the "away" dimension. In one sense they were the cardboard cut-out figures of themselves, now become solid and alive. In another sense they were enormous, standing in mid-air between building tops and heavy cloud layer, visible to all of Chicago's sterile areas. But in a final sense they were even more than this, because they also stretched from Earth clear back across the unbelievable distance of light-years to their own world, where in actuality they still were. And yet, these three things they seemed to be, were really only one. Topologically, in the "away" dimension, all three manifestations were only aspects of single unity—like three views of a torus, the angle of viewing made them look to be one thing, rather than another.

"It's quite true," said the Mantis to everyone in the Chicago District, while the Snail beside him, without moving, slid endlessly over a thin surface of eternally flowing liquid. "There are other worlds; but not for your race, until you can show your right to them."

"You can't stop us," said Jai—and it was a brave statement. With the "away" dimension now visible around them, Jai's talent glowed visibly, like a small sun among the feeble lamps of the other human beings around him. But that glowing was a tiny thing compared to the burning greatness of the Mantis and the Snail.

"We do not stop you," said the Mantis. "We neither aid you nor hinder you. You do it all to yourselves. Think of yourselves for a moment, not as individuals, but as one creature called 'Human' made up of billions of little individual parts. This creature told itself it would

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build a bridge to the stars; but it lied to itself. What its hands were building, all the time it talked of a new world, was something else it wanted much more."

"What's that?" demanded Jai.

"How do we know?" answered the Mantis. "We are not Human; you are. But we can tell you what you have built is not a way to another world. When the time comes that another planet is what you really want—what you want more than anything else—you will undoubtedly find it. And as we neither helped nor hindered now, we will not help or hinder then. We would not even be talking to you now, if one of those tiny parts who knows what Human wants, had not reached us through what you all built, and put upon us the ethical duty to answer him."

The Mantis looked at Chaz and disappeared. It and the Snail were gone. *Away* was no longer perceptible; and the cut-out figures were only cut-out figures again.

Jai looked at Chaz. In that moment, a dull sound was heard, far off across the city, and a faint shock jarred the floor under their feet.

"There goes one of the explosion points," Chaz said. "Tell me, how many did you really find?"

"None," said Jai. "But you've just killed several million people in this district. I won't die; and the other witches won't—and at a guess there'll be some others who'll live. We've suspected there were some exiles that had turned out to be immune. But what about the four million in Chicago district who aren't? At least the Citadel would have gone on keeping them alive."

"You call this living?" Chaz said. "Anyway, you're wrong. No one ought to die unless almost everybody goes on refusing to face up to what's happened. The Mantis was right—the Pritcher Mass never was something to take us to a new world."

"Then what was it?" Jai said.

Chaz shook his head, slowly.

"You're blind, Jai," he said softly. "Self-blinded. How could you live completely inside glass, plastic, and concrete, and never know at all what was outside those things? *'The Earth is the Lord's,'* Paul the Apostle wrote to the Corinthians. *'Late on the third day,'* Albert Schweitzer wrote in 1949, *'at the very moment when we were making our way through a herd of hippopotamuses, there flashed upon my mind, unforeseen and unsought, the phrase "Reverence for Life" . . . Now I had found my way to the idea in which affirmation of the world and ethics are contained side by side; now I knew that the ethical acceptance of the world and of life, together with the ideals of civilization contained in this concept, has a foundation in thought . . .'*

Another faint thud reached their ears and another shudder of the building to a shock wave through the earth below. Jai frowned at him.

"I don't follow you," Jai said. "Are you preaching a set of universal

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ethics? Because if you are, you really are insane. There's no such thing."

"Yes, there is; and there always has been," answered Chaz. "A set of universal ethics have been with us from the beginning, whether we believed in them or not. Certain responses in living creatures, and particularly in intelligent ones, are as hard and firm as physical laws. Why do you think the Mantis and the Snail answered me when I called? They see more laws than we see, and obey more. But we have to obey the ones we can see if we want to survive. If we try to ignore them, we'll become extinct. The responsibility not to foul your own nest is a primitive law. We ignored it; and the Rot came."

There was a third sound of explosion.

"We could have beaten the Rot by getting away from Earth," said Jai.

"No. If we'd managed that, we'd have simply blundered again and created another way to destroy ourselves," Chaz said. "Earth's more than just a place to walk on. Back before houses and fire, and even speech, we found food and shelter and survival in the Earth; and the older part of us remembers it. That part has been fighting all this time for just one thing: to get outside again. Because that—nothing else—is the road to survival."

"I can't believe it," Jai muttered, almost to himself. "We built the Pritcher Mass. We aimed it for new worlds."

"*You* built it?" said Chaz. "You and people like you only oversaw its building. Everyone on Earth built the Mass—creating it out of the basic, instinctive urge to make something that would destroy the Rot, and save Earth, and themselves. You were with me when we met the Mantis and the Snail before; and you heard what the Mantis said. Also, you saw how I reached them just now. The Pritcher Mass isn't out on the platform, beyond Pluto. It's here, on Earth."

Jai stared at him.

"It can't be," the tall man said.

"Why not? You ought to remember the Mantis telling me it was here. What's distance and position to the Mass?" said Chaz. "It's here on Earth, where it always belonged, with the people who made it."

"What sort of nonsense is this about the people back here building the Mass? Not one in three hundred thousand has talent."

"Of course they have," said Chaz. "Every human being's got it. Every animal and plant. Fifty years ago they were proving that plants reacted *before* they were burned or cut. Why do you think the plants and animals aren't touched by the Rot?"

"Next," said Jai, contemptuously, "you'll be telling me the Rot was created by the mass unconscious of the plants and animals striking back at the one species that was threatening their common world."

"Perhaps," said Chaz. "But that part doesn't matter, yet. The point is

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that paranormal talent isn't something sophisticated. It's something primitive and universal. Only humans had forgotten they had it. They made a point of not believing in it. Only those who could believe, like the witches and the ones outside who found themselves immune, used it—because belief can kill as well as save a life."

"Even if you're right," said Jai. "These back here who didn't believe had no part in building the Mass."

"Yes, they did," said Chaz. "The primitive part of their minds worked in spite of them, to survive. They just couldn't use what they built, until they believed they could."

"So you say," Jai answered. "But if you're wrong, you're going to be killing them by slow suffocation when the Rot comes in through those holes you've made, and strangles them."

"Only I'm not wrong," said Chaz. "All they have to do is face the Rot and believe, to conquer it."

He turned and walked back to the table with the camera and recording equipment. The bulky man came forward to bar his path.

IN TIMES TO COME

Clifford Simak's new novel, "Cemetery World," highlights next month's issue. It evokes the spirit of a far-future Earth as only Simak can.

In this distant age, man has spread through the galaxy. But—thanks in part to the persuasions of the Cemetery Corporation—people still return to Earth for their burial. The Corporation wants to make all of planet Earth into a tidy, manicured cemetery. There are others who don't. One of them is an artist who comes to Earth accompanied by an ancient robot, a sensory-synthesizing machine called Bronco, and a lovely girl who's hunting for a treasure.

The cover is by John Schoenherr, showing one of the ancient war machines in the midst of the planet-girdling cemetery.

Also in next month's issue is "Pigeon City," a novelette by Jesse Miller. This tale is about the urban ghetto of the not-too-distant future, where peace and contentment are the rule—most of the time. Miller's a new writer, and his views will probably surprise many readers, both white and black.

There will be two science fact articles next month. One, by G. Harry Stine, shows how pint-sized rockets are being used to measure local air pollution. The other, by newcomer Loren Morey, shows how many of our current rocketry techniques were invented by Cyrano de Bergerac—of all people!

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"Let him talk," Jai said behind him. The bulky man moved aside. Chaz reached the equipment.

"Only, you don't really know for sure, do you?" continued the voice of Jai.

"I believe," said Chaz. "That's all I ask anyone else to do."

He faced the equipment.

"All right, people of Chicago District," he said into it. "Here we go. Whether we win or lose, here we go; because there's no other direction left for us. Reach out with your minds, join me, and end the Rot."

He reached for the Mass-on-Earth once more. But this time, as he did so, he carried in his mind an image of himself as a seed crystal lowered into a nutrient solution that was the as-yet-unaware minds of the four million people of the Chicago District.

"Come on, damn you!" he said, suddenly furious at them. "Join me, or sit where you are and die when the Rot gets to you. It's up to you. You built the Mass—*use it!*"

He stood, waiting. For a long moment it seemed nothing was going to happen; and then, slowly at first, he felt himself being joined. He felt himself growing in otherness and strength . . . knowledge of the Mass waking to consciousness in the innumerable minds about him. The mental seed crystal that was himself was joined by the crystal of other minds, solidifying out of the nutrient subconscious, and their unity was growing . . . faster . . . and faster . . .

"Watch," he said to all of them over the equipment, pointing up through the transparent dome overhead at the sullen cloud layer, darkening now toward night and already streaked and stained with red in the west. "This is how we begin to kill off the Rot."

He reached for the power of the Mass. But now he was many times multiplied by the minds waking up around him; and the Mass-force responded as something much greater than it had ever been. It came at his summons.

It came as it had come before; and there was nothing that could stand before it. It came like the first man striding upright across the face of his world. It came like the will of a people who would not die, breaking out of the trap into which they had fallen. Chaz had imagined it once as a great, dark mountain of wind—and as a great wind it came.

It blew across the buildings and domes of a sealed city; and the spores of the Rot that were touched by it died instantly, as they had died within the lungs of witches and the immune exiles. It gathered strength and roared like a storm. It spun into a vortex, stretching up toward the lowering clouds overhead as the horn of a tornado stretches down toward the Earth. It touched the cloud layer and tore it to tatters, spinning the gray vapor into stuff like thin smoke, then into nothingness.

It ripped apart the sky, moving

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toward the west, destroying clouds and the Rot as it went. A long split opened in the thick cover above the city, stretching westward, like the thunder of ice going out when spring comes to a long-frozen land; and in that split the sun suddenly blazed clear in a cloudless space above a free horizon.

Below the top floor of the Embry Tower, the mind of Chaz was now wrapped in the crystalline unity that was the consciousness of some millions of other minds, just-wakened and waking to their ancient abilities. About him, Chicago breathed newly breeze-stirred air with four million breaths. Not merely Eileen, not merely the witches, or the immunes from outside like Red Rover, or even Jai and the Citadel Mass workers—but all those who lived and were human were now beginning to join the unity, striking back with the non-physical tool they had created when all purely physical tools failed them, at the enemy that had threatened to choke them to death or seal them in air-conditioned tombs.

The last clouds went. The sunset spread across the sky like a cloth of gold. And in the east like sequins along its fringe, where the gold deepened in color towards the night, glittered and burned the first few beacon lights of the stars, unobscured once more—and now, in real terms, waiting. ■

METALLIC OR NONMETALLIC?
by Joseph C. Stacey

Listed below are 18 chemical elements—nine are metallic, the other nine nonmetallic. Do you know which are which? Can you identify at least 13 of them correctly for a passing score? 14-16 is good; 17-18 excellent. Answers on page 58.

___ 1. Antimony	___ 7. Lithium	___ 13. Bromine
___ 2. Barium	___ 8. Fluorine	___ 14. Sodium
___ 3. Calcium	___ 9. Phosphorus	___ 15. Selenium
___ 4. Carbon	___ 10. Silicon	___ 16. Chlorine
___ 5. Cobalt	___ 11. Potassium	___ 17. Sulphur
___ 6. Iridium	___ 12. Iodine	___ 18. Mercury

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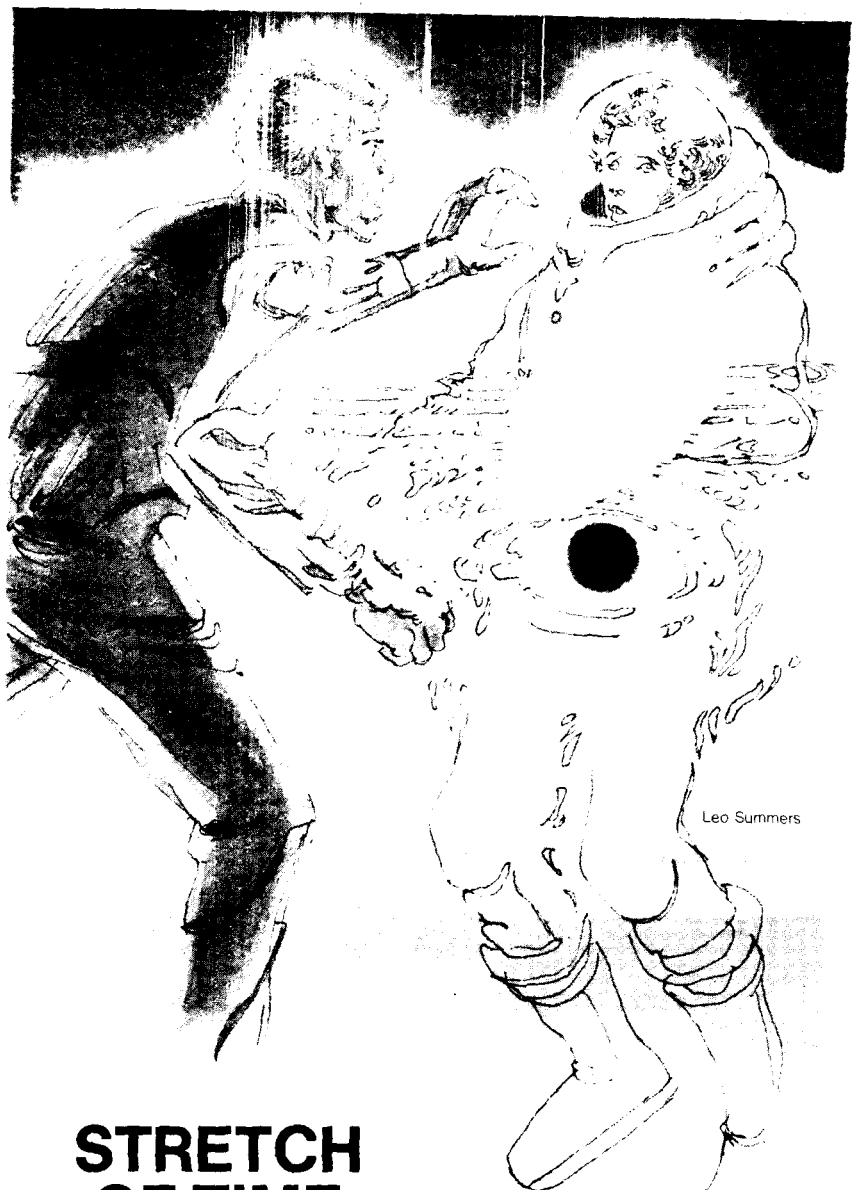

Leo Summers

STRETCH OF TIME

Making a successful time machine doesn't necessarily mean you can travel through time.

RUTH BERMAN

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"But I can *do* it." Sylva Fontis ran her left hand through the short curls of her hair as if trying to wring better words out. As always when excited, she lost command of her Standard and began to stammer in Italian. She fell silent, let the hand drop, shrugged and stood still, staring enviously across the desk at Jason Kent's calm, distinguished face under its thatch of calm, distinguished gray hair. He even looked like a head-of-the-department at Luna University, which she thought an unfair additional gift of the gods.

"Syl, are you feeling all right?"

"No. My stomach is tied up in square knots." She grinned, suddenly impish. "But what you mean is: am I sane?"

Kent absently drew the end ball back from his desk-sized model of the conservation of energy. He let the ball drop. It floated leisurely down and struck the next ball. He watched as the little spheres clicked each other forward and back again. "Yes," he said, "I suppose that is what I mean." He looked up at the round, serious face. "Oh, for God's sake, sit down. You look sane, I'll say that for you."

"Thanks." Fontis perched herself on the chair at the side of the desk and wound her feet around the chairlegs. She had still not lost the newcomer's subconscious fear of floating away in the light gravity, after two and a half years at Lun-U. "I can't prove it," she said, "but I can show you."

"What? You mean you've actually built a. . . a. . ."

"Dimensional Revolver, I call it," she said helpfully.

Kent snorted. "Sounds more like some kind of pistol than a time machine, if you ask me. And you actually tried it out?"

"Yes."

Kent waited, but Fontis did not go on. "Well?" he said. "So what did you do, bring back the results of the Centauri Probe? Kill your grandmother?"

"No. I didn't travel in time at all, if you get right down to it."

"Syl—" Kent said, exasperated, then broke off and waited some more.

"I was afraid to move, if you follow me." Fontis wriggled on the chairseat and retwined her feet into another improbable configuration. "I could see me in cross-section stretching out in an endless line straight back to the past horizon: a long, olive-green pipe with a ridge of olive-green where my arm was—" She pulled away from the memory

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and said lightly, "Why do all the pressure suits have to be such drab colors?"

"Pressure suits?" said Kent. The conversation seemed to be getting out of hand.

"Well, I wasn't sure rotated air would be breathable. It seemed like an obvious precaution."

"Oh. All right."

"Although, at that," she said thoughtfully, "I shouldn't talk about looking at the past horizon. There wasn't any horizon. It was a true Euclidean plane. The lines just stretched back until optics took over and made them seem to come to a point. It's a pity we're so shut in here—the way the walls of the lab closed in it was like looking down a long tunnel. It would be interesting to see a more open landscape . . .

"Then I started wondering what the Revolver itself looked like in cross-section extended back in time that way. It'd turned me to the side of the hand that wasn't holding it, you see. That is, I had it with me, in my left hand, but the cross-section of it into the past must have been there on the other side of the cross-section of me. I could see it would take too long to get around me pastward, and futureward I couldn't see anything; it was like trying to see through one-way glass. I was afraid to try walking into it." She hunched her shoulders as if trying not to shiver at the idea. "So I twisted back into normal space again. And I came to you. If you'd be willing to try it yourself—"

"No, *thanks*."

"But—"

Kent rubbed his palm on the fake-wood pattern of the plastic desk and imagined a rectangular arch of tan-colored plastic extending . . . five years? ten? He could not remember when the budget had last allowed for new desks. "No," he repeated. "For example: how do you know that your invention isn't actually a new kind of hallucinogen rather than a time machine?"

"Oh, but—" Fontis protested, and stopped again. She considered, then unwound her feet to free her body for a massive shrug. "Possible, but not probable, sir."

"Hm-m-m. . . I see," said Kent. "But maybe we can work out a test for you to run to give us something objective. Give me some more information. I gather your . . . Dimensional Revolver is not an elevator with centuries instead of floors?"

"No, nothing so pretty." Fontis sat forward, becoming suddenly both eager and relaxed as she described her pet. "We live in four dimensions and see three. The Revolver turns a subject so that one of the dimensions he sees is the temporal. Say you see up and down, right and left. In normal space, the third dimension you see is forward and backward, but now . . . then . . . in that case . . . you see future and past instead."

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"Except you didn't actually see the future."

"No."

"A shame." Kent sighed and looked put-upon. "Why couldn't you be interested in something normal, like a faster-than-light drive for the starships?"

"Not possible," she said, and one side of her face twisted up as she recognized the irony of the disclaimer. "But I admit it's an interesting topic. We're probably never going to have practical star travel without FTL ships."

"Not necessarily." Kent enjoyed quibbling, especially on his pet subject. "With a ship at a reasonably high sub-light speed, as soon as the engineers manage to build one, you could reduce a twenty-year trip to a few days of the travelers' time by the clock paradox, and then reduce the journey to a few days of Earth's time by going back in time as far as needed. How long is a year anyway, spatially speaking?"

"I don't know. I told you I don't have the theory worked out," Fontis said apologetically.

The end-of-period bell whined. They both checked their watches, surprised at how much time had passed.

"You have a class now?" Kent asked.

"Yes. Bonehead physics." She wrinkled her nose. "I get to tell a bunch of drowsy sophomores all about the Theory of Relativity and the constancy of the speed of light and its importance in so many equations and so on, and how interesting that is."

Kent shook his head. "Phony enthusiasm will turn them off faster than open dullness."

Fontis smiled sheepishly. "I'm not that bad in class. I get interested in it once I get going."

"Suppose I burned a piece of paper, or something like that," Kent said. "Could you go into the past and bring it back?"

"I don't know if it's possible to enter the past that way," she said hesitantly. "The paradoxes, you know what I mean?"

He nodded.

"I'd rather stick to simple observations, for the time being."

"All right," said Kent, leaning back in his chair. "Come in again after class. I'll have a test ready for you." He glanced sharply at Fontis to see what her reaction would be.

She jumped up, her round face looking as exalted as was possible to nonascetic features. "Thank you, sir," she said. She stood quietly smiling for a moment, then scrabbled her notebooks together and went loping out the door.

Kent sat fidgeting for a few moments, then got up and began pacing around the little office. At the end of the third circuit he told himself, "Oh, for God's sake, *you* sit down." He eyed the various objects on his desk, then dumped the last remaining chocolate bar out of a candy dish

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and dropped the bar into a desk drawer. He unhooked one of the little brass balls from the energy model and flipped it into the empty dish. He shoved the dish to the far corner of the desk and looked at it quizzically for a few moments. Then he shrugged his shoulder a little and pulled out the budget papers he had been working on before Fontis came in. He worked doggedly for the next hour, allowing himself a break at every quarter hour to be spent daydreaming about Next Year When It's Someone Else's Turn To Be Chairman.

The daydream, however, failed to *relax him as it should have.* Thoughts of his having time to work on his own research again led him to thoughts of research in general and straight back to Sylva Fontis. She was building up material for quite a dissertation—although he was still not convinced that it was a dissertation in physics. He hoped it wasn't dangerous. Quite apart from the presumed Loss to Science (he lingered on the phrase, visualizing Science as a Little Bo Peep trying to hook in little lambs of scientists), he had a terror of the job which inevitably followed any casualty, of informing family and friends and (probably) lover.

But in another year his turn would be up, and someone else in the department would have to take on the chairmanship, and he could get back to his own work. After all, research was the primary purpose of his job, and . . .

Each time he caught himself repeating the cycle, he pulled the budget back and tried fiercely to concentrate on it. He wondered how Sylva Fontis was doing at explaining the constant value of the speed of light, and scolded himself again for getting nothing done. But when he stopped for the third time, he was startled to realize that he had almost completed a reasonable first draft of a priority-for-grants list.

When the class period ended, Kent took the little brass ball out of the candy dish and hooked it back on the model. Then he sat quietly, *stewing over what Fontis had told* him and trying to isolate the wrongness he felt in her account. He did not stop until an olive-green armored knight came clomping lightly into the office.

He blinked, and the vision resolved itself into Sylva Fontis in her pressure suit carrying a shield-shaped network of crystal threads on her left arm. The threads were woven together in a complex pattern that caught even the carefully neutral, diffuse Base lighting and flashed it back in fires of blue and green.

"That it?" he said, nodding at the crystal web.

"Yes. Have you thought of a test?" Her voice lost all overtones, coming through the suit's speaker, and sounded cold and flat. Kent could only guess at the intensity that should have been in the words.

"Yes," he said. "I had something

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in here." He tapped the dish. "Tell me what it was."

"Uh . . . I don't know if I'll recognize it in cross-section."

"Doesn't matter. You'll be able to describe the color, size, shape." Kent again tried to visualize a cross-section of the universe stretching straight back into the past.

"Yes, sir."

The web had only one control, a switch on the inside, dimly visible to him through the translucent crystals. She turned it to the side, closing it, and the wrongness came clear at last in Kent's mind. It should have turned.

A medusa's knot of threads joined together in the center of the web.

"No!" Kent shouted.

At the center of the web, reflected lights gathered, and shone intolerably bright.

Kent blinked, and the blaze was gone, leaving a large dark spot in the center of his vision. He pushed himself out of his chair. Perhaps he could still get over the desk in time to stop her.

The joints of the pressure suit slowly bent and sagged, held partly upright by the stiffness of the suit itself.

"Too late," Kent thought. But he jumped the desk anyway and was able to catch the body before it finished falling, and he settled it into a chair. He unsealed the helmet and felt for the pulse at the ear.

She was alive.

Kent leaned back on the desk, feeling suddenly too old to support himself even in the weak gravity. It occurred to him that, indeed, she had to be alive—otherwise, she would not have made it back to the "present" and would. he supposed, have simply vanished away. He shivered and felt profoundly grateful that he was not going to have to announce any such unprecedented casualty.

He began methodically unsealing the other seams, releasing the stench left behind by recycled sweat and urine. He gagged and had to stop to turn up the room's air-conditioner.

Fontis opened bloodshot eyes and began feebly trying to undo the rest of the suit.

"Sit still," ordered Kent. He slipped the web off her arm, then went around to the front of his desk and rummaged through until he found the chocolate bar, which he unwrapped and brought to her. "Can you manage that?"

She bit off a third of it by way of answer, and crunched it down. "God, I'm hungry!" she said. She finished off the chocolate, then put up a hand to feel the loose flesh at her throat. "I wanted to lose a few pounds, but this is ridiculous." A little chocolate had melted on her palm. She licked it off. "Mr. Kent, I'm sorry, I couldn't find anything in there."

"Later, Syl. You need proper food and rest." He buzzed the Base cafeteria and arranged to have a tray brought to Fontis' quarters. "Feel up to walking—just a little more?"

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She nodded, and stood up, wriggling to let the pressure suit fall off. Leaning on Kent's arm, she stepped on each of the boots in turn, pulling her feet out of them. They left the suit sprawled on the floor, and Kent half led, half carried her out.

The food was there ahead of them, and Fontis began gulping it down, beginning with the dessert. Once the ice cream was down, she forced herself to chew and swallow slowly, for fear of making herself sick.

"How many days were you in there, anyway?" Kent asked.

She darted a look up at him and stopped eating long enough to give a sigh halfway between a sob and a chortle. "I spent two days . . . I mean, it felt like two days . . . I mean—" She broke off and ruminated. "If I can call it days."

"Metadays," Kent suggested.

"All right, metadays. I spent two of them slogging along before I realized what all those damn straight lines into the past meant and turned back."

Kent nodded. "I should have realized it when you said you'd seen yourself the other time in straight lines. You should have seen a curve or an angle from when you'd walked into the room, even if you hadn't moved at all since. So, time is so long that the immediate past is as far back as you can see before the laws of perspective take over and make the lines converge. I'm afraid your time machine isn't very practical," he added, with careful lightness.

"Practical? That's for engineers," she said, trying to match his tone.

Kent pursed up one side of his mouth and considered the matter. "No," he said, "I'm afraid what it'd take would be the FTL drive."

"That's not my field."

"I know," said Kent. "It's mine."

She looked up at him and inspected his face. The even features did not let the emotion show which she heard in his voice, but she was almost sure he had sounded envious—of her, as unlikely as that seemed. "Well," she said, "I don't see why you should have realized, when I was the one who had it staring me in the eyes. And I was telling my sophomores all about it just two days ago. I told them that the value of the speed of light is a constant that turns up all over the place. So an hour is . . ." She rubbed her hand across her forehead. "I'm too tired to multiply," she said. "But one second is 186,000 miles long. And there I was trying to cover several minutes."

She swallowed the last of her algae sandwich and lay down, already half asleep.

Kent dimmed the light and, picking up the empty tray, left the room. As he walked down the corridor, his thoughts took up again the pleasant daydream of Next Year When It's Someone Else's Turn To Be Chairman. It would feel good to get back to research again, and leave administrative chores to his successor. ■

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P. Schuyler Miller

POINT OF VIEW

In the March 16, 1972 issue of the New York *Times* one of their reviewers, Christopher Lehmann-Haupt, reported two science fiction novels under the heading "The Putrid Goo and the Zombie." I hadn't seen either of the books, whose publishers evidently didn't want them stigmatized as SF, but I have remedied that shortcoming.

The books in question are "Mutant 59: The Plastic Eaters" by two English authors, Kit Pedlar and Gerry Davis (Viking Press, 246 pages, $5.95) and "A Report from Group 17" by Robert C. O'Brien (Atheneum, 210 pages, $5.95). "Mutant 59" was a Literary Guild selection, and there will be a Science Fiction Book Club edition by the time you read this; I believe it will also be filmed in the goo genre. Of it, the man from the *Times* said: "The whole gooey mess is so drearily predictable that I can only suggest you catch this one some slow night on the Late Show." He prefers "Group 17"—"a little biological time bomb whose ticking gets one so anxious that at times it's difficult to keep reading."

My own verdict is just the reverse. "Mutant 59" is excellent science fiction in the manner of "The Andromeda Strain"—a kind of English equivalent—though more florid and frantic. "Group 17" is a wholly ordinary spy story tricked out with some Mad Scientist trappings.

Science fiction readers may not be completely peculiar, but we have a different point of view from uninoculated readers.

"Mutant 59" is "hard" biological SF, as "Andromeda Strain" was. Through the first two-thirds or so of the book, the scientific puzzle is foremost—and it evidently goes right over Mr. Lehmann-Haupt's head, or bores him stiff. In England, the industrial empire that has been raised on a couple of unique plastics begins to totter when a series of catastrophes are traced to failure of insulation made from their product.

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Within this Kramer group some scientists are trying to find out what is happening, others are covering up to protect themselves from possible blame, still others are too busy with infighting to contribute much. Then the puzzle takes an unexpected turn—which confuses the *Times* man but delights me—and in the final third, as plastic dissolves everywhere, we are swept away in a gooey melodrama right out of "The Blob" (they can use the same pink tapioca in the movie). But even here, the authors' evident familiarity with odd corners of London gives the action a sense of place that adds a lot.

"A Report from Group 17" is a biological-threat story, too, but an utterly conventional one. A Nazi scientist in Russian employ is smuggled over to an old mansion just up the Potomac from the Washington water supply, where he is supposed to develop a plague that will wipe out the city in time of need, in spite of chlorination, fluoridation and other treatments it may be given. Instead, he is working on a project of his own—started in the Nazi abattoirs—to infect people with a virus that will convert them into utterly docile zombies. He needs a human subject, so he kidnaps one: a teen-age girl who has been snooping over the wall (and whose little brother honorably refuses to tell anyone where she is). Fergus O'Neil, Harvard virologist, is brought in by a top secret intelligence corps to find out exactly what is going on, and the story then follows its obvious course.

The problem seems to be that to Average Reader (Lehmann-Haupt) the technical puzzle of "Mutant 59" makes no sense at all. He doesn't realize that there is a puzzle, and he certainly can't follow it and is bored by it once the gooey stage effects pall. In "Group 17" there is a simple, straightforward plot: kidnapped girl, crazy Nazi, heroic scientist in love with Mama (happily, not the fourteen-year-old). He's seen it on T.V. every night for years. It turns him on.

Not me, though . . . and I suspect, not you. Try the plastic goo.

TUNNEL THROUGH THE DEEPS

By Harry Harrison • G.P. Putnam's Sons, New York • 1972 • 192 pp. • $5.95

If you are reading this, you have probably just finished reading the (presumably shortened) serial version here in Analog as "A Transatlantic Tunnel, Hurrah!" Three parts, last April, May and June (the book beat the last installment into the stores). This report, then, is for those of you reading Analog for the first time.

What we have is a thoroughly amusing pastiche of a typical Victorian or Edwardian melodrama, complete with heroic speeches, stalwart hero, black-hearted villains, and engineering marvels that would do Jules Verne's heart good. (Will some medium or yoga read it to him, please?)

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The noble hero is one Augustine Washington, trying after two hundred years to live down the traitorous reputation of his sneaking ancestor, George, who lost the battle of Lexington to Cornwallis. Gus is one hundred percent American, dedicated to winning dominion status for the American colony, but equally dedicated to making good as an engineer and building that tunnel under the Atlantic to connect Lands End with Long Island. His innovations don't go down so well with Sir Isambard Brassey-Brunel, who designed the tunnel and whose beautiful daughter Gus hopes to marry. But there are perils, marvels and adventures enough to keep any red-blooded American youth occupied.

You see, in the world where Gus lives, a certain Spanish shepherd was betrayed, there never was a Spain or a Columbus. England discovered and developed the Americas, the Indians hung on to land and status . . . but find out for yourself what happened.

AND ALL THE STARS A STAGE
By James Blish • Doubleday & Co., Garden City, N.Y. • 1971 • 206 pp. • $4.95

Any newcomer to these pages who has not read anything by James Blish (Blish has been exploring fantasy and historical fiction for some time), should get the paperback omnibus of the entire "Cities in Flight" series. It's published by Avon Books under that title as their No. W-187: four complete novels with a cosmic scope and sweep—607 pages—for only $1.25. I think this has all the revisions of the English hardback edition, which Blish has insisted for some time is the definitive one.

He must have enjoyed this excursion into "conventional" science fiction—which he made anything but conventional—for he has done the same kind of story in "And All the Stars a Stage." It's expanded from an *Amazing* serial of 1960. This is not a story about the space-wandering cities, nor about the universe in which they navigate, but it is a story of cosmic voyaging in quest of a new home for mankind.

Jorn Birn, the hero, lives in an era when women have long dominated the planet, and when the world's population is getting out of hand. A faster-than-light space drive, the Ertak effect, has been discovered, and crews are being trained to begin the exploration of space. Then astronomers discover that their sun is about to explode, and thirty-one starships manage to take off, leaving most of the world's population behind. They cruise among the stars in search of habitable planets, finding strange perils here and mysteries there, just as the Okies did with their flying cities. There are inner crises to keep pace with the outer crises. One by one the ships drop out of communication range, until Jorn's *Javelin* roams on alone, its crew aging, the great Ertak weirdly changed. Wherever they go, they find human beings

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at the top of the evolutionary column (something Blish sloughs off disappointingly, after making sense of stranger things), but none who will welcome them.

All this while, Blish has been quietly planting little aberrations in the details of his story. They may nag at you a *little*—then he seemingly explains them away. But in the end . . .

After all, that's for you to find out.

MIDSUMMER CENTURY

By James Blish • Doubleday & Co., Garden City, N.Y. • 1972 • 106 pp. • $4.95

This book is scarcely more than a stretched novella. It was in *Fantasy & Science Fiction*, complete, and complete in sixty-five pages, last April. (Doubleday is using bigger type.)

This is a future-adventure story written to embody some of the author's ideas about the nature and functioning of ESP and the "mystical" realm that has become so big with intellectuals and rejecters of rationalism. Blish is by no means doing that, but he has been devoting himself to mysticism in his recent religious fantasies—not reported here—and evidently had some left over. It is also his contribution to the Men-versus-Birds genre of Philip MacDonald, Daphne DuMaurier and Alfred Hitchcock (perhaps because Blish is now living and writing in their England).

After the traditional accident, John Martels finds himself—his persona, at least—in the future of some 23,000 years hence. Most of mankind is reduced to a scattering of primitives at perpetual war with the Birds. Martels is sharing the brain of a kind of organic computer which serves as their oracle while it dreams of coalescing with the more powerful computer in a kind of civilized enclave somewhere in Antarctica.

Martels, as an impatient twentieth-century man, does what the Qvant has only hoped to do. He finds a way of getting "himself" into the mind of one of the natives, and starts a trek through the country of the Birds, bound for the South Pole. I feel that the Birds themselves needed more development; the nightmare is a bit too wispy. At least, we do have more Blish.

THE SWORD OF THE SPIRITS

By John Christopher • Macmillan Company, New York • 1972 • 162 pp. • $4.95

This book completes what might be called the "Prince in Waiting" trilogy, which began with that book and continued with "Beyond the Burning Lands." This is by far the best, most believable, and most mature of Christopher's recent juvenile science fiction series. It hasn't the gimmicks and show pieces of the "White Mountains" trilogy, and I don't know how young people will react to it, but it should last a good deal longer.

This is England of the distant fu-

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ture, when a natural catastrophe or nuclear warfare has raised a volcanic belt (the Burning Lands) across the island, apparently from the Bristol Channel to the Wash. Technology has been driven underground and radioactivity has caused a proliferation of mutants, both among animals and among men. In the feudal cities of the southern counties, "polymuf" animals are killed but not eaten, "polymuf" children are killed at birth (though a few manage to survive). A dwarf strain has bred true and assumed its legendary importance as a race of craftsmen.

The books follow the quite unorthodox adventures of Luke, selected by the Seers (who preserve science and technology against a hoped-for future) as the "Prince in Waiting" who will one day unite the cities of England. In the earlier books, he was deposed as Prince of Winchester, crossed the Burning Lands to become a hero among the less uptight survivals of the Welsh, and returned to kill his brother and win his title. In this final book his character betrays him and his promise is lost.

This is not only Christopher's best work for young people, and one of his best SF books for anyone, but a wholly believable evocation of a future feudalism—a theme often tried but usually wanting. I hope it will one day be collected into a single volume with illustrations by Emanuel Schongut, who has done the superb jackets for all three books.

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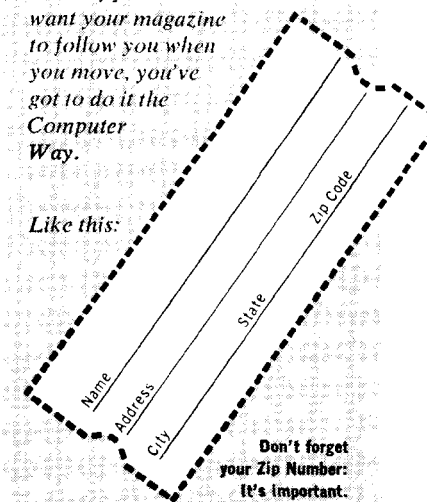

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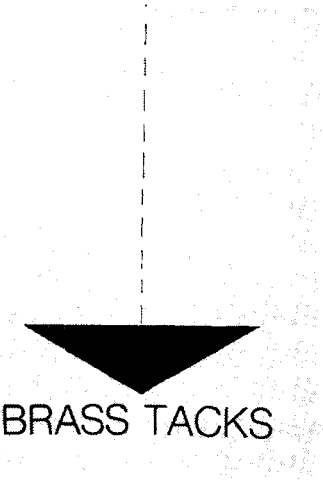

Dear Mr. Bova:

Since it was an election year, I took the liberty to write a couple of congressmen and senators concerning a commemorative stamp for John W. Campbell, as suggested by Joe Ross in Brass Tacks, March 1972 issue.

Initial results: reply from Senator Goldwater and Representative Steiger that they would look into it. Steiger sent a letter two days later that "The proposal has been presented to Citizens' Stamp Advisory Committee for consideration as future stamps [sic] programs are developed." It was signed by John W. Powell, who is Postal Liaison Officer.

The Division Manager of Philatelic Affairs, Gordon C. Morison, also replied that "This proposal is on the agenda for consideration by the Citizens' Stamp Advisory Committee as future stamp programs are developed."

That's the tally sheet for what it's worth. I'm out of buttons to push, but I hope that others will have bigger buttons available.

HAROLD G. THURSTON
1025 North Kadota
Casa Grande, Arizona 85222

How about contacting your local philately club?

Dear Ben Bova:

It has been my observation that gods always fall, and for years science fiction was spelled SCIENCE and practically worshiped in this country. The reaction was inevitable. Especially when the shortcomings are becoming apparent.

I don't think anyone really wants to do away with technology, not even the most far-out Thoreau type. At Woodstock some very complicated technology produced and recorded the music.

We do have a first-generation technology and we do have cultural lag—or do we have perhaps good old-fashioned American greed? Man is a whole and the social structure must be examined as well as the state of the technology. Is the present society of humans willing to pay the price of second-generation technology? Will business assume any of the costs? How far can the gap grow between the haves and the have-nots? How heavily can you tax the middle-class American before he rebels? I think you cannot disregard sociology even if you may, like John W. Campbell, feel that it is a false science.

You mention the SST. Human

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beings are seldom calm, you know. Nuclear power plants. The public reaction is understandable to me. Atomic power is ineradicably associated with death in the minds of the populace. What else have they ever been told in a voice loud enough for them to hear? How do you go about wiping out the image of the mushroom-shaped cloud from their minds?

So who is responsible for the foregoing? I personally lay much of the blame (or credit) to the United States Military. They are supposedly under civilian control and serve the people but they act as if they were outside of any type of control. This is exceedingly dangerous! A war-based economy threatens our existence more than anything else. If you operate on the assumption that you can scare the hell out of the American people, including members of Congress, you can get the money you need for new military toys.

Space is being made a scapegoat. If you can divert attention from the billions being spent on military hardware and weapons research and focus attention on the paltry amounts spent for the space program, you can get people all excited about wasted tax money. I repeat, human beings are seldom calm.

If the space program were shut down entirely what guarantee does anyone have that the money would go to the poor? I have observed that black people in particular seem to have been sold this bill of goods.

One key to our present problem seems to me to be to change the cultural attitude of two hundred million people. A tremendous task!

How do you go about changing a consumer-oriented, throw-away society to one that uses technology as it should be used? Especially when American society as it presently exists is so profitable for the fortunate few. But I think that's what the radical anti-technologists really want, whether they know it or not.

I personally hope the anti-technologists keep on screaming. At least they are calling attention to the hideous side effects of first-generation technology. Change does not come because people politely say "please."

LEIGH COUCH
Number 1 Cymry Lane
Route 2, Box 889
Arnold, Missouri 63010

For many years, military technology was the only large research and development effort that the American people would support—except for medical research. Military R&D served as a spearhead for technological progress. So far, nothing has replaced it.

Dear Mr. Bova:

Charles Bernstein and Joseph Eastern seemed to have gotten the wrong impression from the letter I wrote (Brass Tacks, May 1972). I did not, I have not, nor will I ever condone or advocate the use of the

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Mafia or any other criminal organization as a surrogate police force. I just wanted to point out that as long as hoodlums and vandals were protected by press and courts as political martyrs, the police wouldn't have much of an effect in controlling or preventing riots.

If I were to discover that a local college dean had used illegal forces to clear his campus, I'd be hollering for his dismissal immediately. I was just pointing out that if police were so hampered by court rulings and bloated press reports that they couldn't function effectively, an alternate method of quieting the campus would have to be used. I picked the Mafia because it is the best-known actual large crime organization. If I had known that my choice of criminal societies would have caused such a ruckus, I would have referred to a fictitious group such as Ian Fleming's S.P.E.C.T.R.E. or the Monster Society of Evil from the old Captain Marvel comic books. Or most probably, I'd have not used a name at all but merely called them "gangsters."

What I was saying in my letter was that if the students who were rioting weren't quelled, the police and law and order would be ignored. That would be barbarism, which would soon be followed by fascism.

Yes, Mr. Eastern, I know that the police are a law-enforcement agency. However, law enforcement to me does not mean saying, "Aw, won't you please leave, aw, pretty please?" to a rioter, but rather to tell him to get off and to forcibly eject him if he doesn't obey authority. Neither am I so naive as to expect the Mafia to fade into the woodwork if it were called upon to battle rioters. (Question: What would your opinions of my letter have been if I had said Jewish Defense League instead of Mafia, Mr. Eastern? Hm-m-m? I fail to see any distinction between the two, as both are criminal organizations that depend on violence for their effectiveness.)

At the time I wrote the letter (summer of 1971, a month or so prior to the death of John W. Campbell), I had seen campus rioters turn our centers of higher education into battlefields. I disagree with Mr. Eastern in the aspect of violence being used to combat violence. Until the day comes when a safe, nonlethal knockout gas or stun gun is invented to control mobs, the old-fashioned phalanx will have to be used to control and contain rioters.

However, I must admit that the police have done an effective job. If any leader attempts to start a riot this summer I'm fairly certain he would be quickly shot—*by the students!* The college students have had their fill of outside troublemakers tearing up their campuses. Any violent protest would soon wither due to lack of support.

The students refusing to help the potential rioters is the best thing they could possibly do. Remember, the police are effective only if (1) the cit-

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izenry aids the police, and (2) the citizenry refuses to aid the criminals.

I did not advocate vigilantism in my letter. I merely looked at what had happened and was happening and gave my opinion of the future. I do not want to live in a vigilante-ruled state, but when the police are scorned and ignored, who's going to supply adequate protection to the common people, huh? Already, numerous local and neighborhood organizations have been set up across the nation (that is, the aforementioned Jewish Defense League, the blacks and chicanos in Chicago banding together to get drug pushers off their neighborhood streets, the White Citizens Defense League in New Jersey, et cetera). I think that if everybody were to refuse to lend aid or sympathy to the "revolutionaries" *and* the Mafia and other criminal organizations, there would be no need for vigilantes.

I don't oppose protest. I think it is a good thing that citizens of this country can express their views (as I did in my letter and Mr. Bernstein and Mr. Eastern did in theirs). But I do oppose an untutored, freeloading bum burning down a multimillion-dollar library or sniping at a policeman.

But if you consider that ridiculous and preposterous it is your opinion.

BUZZ DIXON
519 Aberdeen Drive
Raleigh, North Carolina 27610

But who defines "criminal," "bum," and "vigilante"? Our system of courts and laws is designed to protect the individual against the state. When you give the state too much power, individual freedom dies. Is "tyranny" better than "unrest," or does it depend on who's making the definitions?

Dear Mr. Bova:

I'm looking for reason, rather than rhetoric!

In your March editorial you said:

"The tragedy of our prison system is that we—all of us—are losers: Prisoners, guards, government officials, families, taxpayers."

"Most of the real criminals in the country have seldom, if ever, seen the inside of a jail."

"Point number two about the prison system: many of the inmates are mentally ill."

Good God, man, you're telling me that these people are "more to be pitied than censured" and, by the way, they're not *really* criminals. What are they? They've been convicted of felonies, haven't they? Crap!!!

April editorial:

"High-speed trains go through many cities, towns, counties, states—each with its own set of politicians, union leaders, landowners, and cantankerous citizens. Urban renewal has become a political football in most cities. Education is at the mercy of thousands of individual school boards that are more interested in keeping costs down than in improving the quality of the children's education."

High-speed *freight* trains also blow

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up towns that they don't quite make it through. Is it any wonder that the citizens are cantankerous? Urban renewal can be nothing but a "political football" for there are just a helluva lot of people opposed to it, for reasons in addition to money. Does *anybody* have a greater right to run the schools than the parents of the pupils? You can talk till you're purple and you'll never convince me that you, or any other "social expert" are capable of determining my needs (or those of my children) better than I am.

You're right, in one respect: the federal government screws up everything it gets its grasping paws on. You are *not* right that the "intellectuals" have the answers to the problems—problems are solved by pragmatists. Here you're telling me that if the government will just heed the intellectuals and pass the laws they (you) want, the rest of us dumdums can just sit back and let Uncle Sammy run even more of our life (and charge us a bunch more for the privilege).

As one who has worked in the "intellectual community" all my adult life, as an honest-to-God systems engineer (not a systems analyst), I've had a gutful of self-styled "intellectuals." I'm not slamming the very great number of very good men who do good work and accomplish miracles. However, damn few of them consort with, or consider themselves, intellectuals.

Think, man, think! This is a *real* world we live in, not the Utopian figment of someone's imagination wherein everything will come out right in the end, if we only mouth the proper high-sounding phrases.

C. E. DECKARD
2923 Berkshire Drive
Huntsville, Alabama 35805

Nor will the world become good, true and beautiful if we keep on following the rough-and-ready nineteenth-century attitudes that have gotten us into the state we're in. We have the brains to solve our problems—but do we have the guts?

Dear Ben:

Having been a Spacewar addict since my freshman days at MIT ten years ago, I've enjoyed reading the articles and letters about the game. They really recalled old times.

I'm particularly glad they appeared, because they spurred me to follow through on something I'd been fiddling around with ever since I graduated from MIT—devising a way to play Spacewar without a hundred-thousand-dollar computer installation.

We had a lot of fun with "Computerless Spacewar" at the Noreascon, and I'll be glad to send the rules to anyone who's interested.

ERWIN S. STRAUSS
1015 Laguna Street, Suite 10
Santa Barbara, California 93101

Is Man replacing the Computer?

Dear Mr. Bova:

I have just read your editorial in

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the April issue of Analog and seen the reproduction of the poster from Kelly Freas. It occurred to me that while many supporters of the space program like to draw a parallel between the voyage of Christopher Columbus and space exploration, the parallel is a very poor one.

Queen Isabella had a very tangible reason for backing Columbus, namely money. Columbus not only believed that the world was round but that there was a direct sea route across the Atlantic between Europe and the Orient. The Portuguese had recently discovered a direct sea route to the Orient via the Cape of Good Hope. This sea route enabled the Portuguese to trade directly in the Orient for valuable commodities such as spice, incense and silk. Previously, these valuable items could only be gotten through Arab and Turkish middlemen who naturally charged high prices for the goods. By trading directly with the producers, the Portuguese were able to sell their products at lower prices than the other European traders and still make large profits. If there was a direct sea route to the Orient across the Atlantic and Columbus found it, then Spain would have been able to make large amounts of money, as Portugal did, from the Far East trade.

Of course, Columbus never found his sea route to the Orient but discovered America instead. While the discovery of America did bring in vast wealth to Spain from unexpected sources, the voyage of Columbus was made on the expectation of bringing in vast wealth from an expected source, the Far East trade. Hence any attempt to draw parallels between space exploration and the voyage of Columbus really only points out the need to provide a solid reason that will make gut sense to people and not just abstract sense as to why the space program be continued.

DANNY LOW
711 Pacific Avenue, No. 116
San Francisco, California 94133

It seems that the general public doesn't count knowledge as wealth. In the long run, knowledge is the ONLY wealth!

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EDITORIAL

continued from page 7

some imaginative tinkering by Michael Faraday, Thomas Edison, Charles Babbage, and a host of other scientists and engineers, we have electronic computers that are getting smaller and smaller, smarter and smarter, and cheaper and cheaper. Desktop computers are here now. Pocket-sized computers are on the way.

As the First Industrial Revolution freed man from physical slavery, the Second Industrial Revolution will free him from mental drudgery. It's silly, uneconomic and immoral to make a man dig a ditch with a pickax and shovel when the same man—with a bit of training—can operate a backhoe and get the job done in minutes, rather than hours. His productivity zooms up, the cost of ditch-digging goes down, and his back doesn't ache so much when the day's work is done. Similarly, it's ridiculous for a man to stand on an assembly line eight hours a day turning a few screws as widget after widget passes by, when a computer-directed robot can do the job more accurately, more cheaply, and without complaining about the hours, the pay, the fringe benefits, the foreman, the shop steward, et cetera.

The assembly-line worker is metamorphosing into the one-man factory manager, just as the plowman evolved into the tractor-driving farm owner. Automated factories are here now. Robots are working on the assembly lines of Ford and General Motors. The next U.A.W. negotiations will include arguments about them.

Of course many people are frightened by the prospect of being replaced by automation. And for good reason. If a man's going to lose his job, platitudes about the march of technology aren't going to soothe him. Or his union.

One of the major social questions of the coming decade will involve automation. Most of the jobs in today's marketplace will disappear, ultimately, just as we have scant need for saddle makers and quill sharpeners anymore. New types of jobs will come into being, and there's going to be an enormous increase in demand for service-type jobs; personal relations will become increasingly important in a society where most of the hard goods are made—and designed—by machines. But the displacement effect of automation is only beginning to be felt. An unemployed welder won't necessarily be retrainable into a social worker.

The *long-term* effect of the Second Industrial Revolution will be to enormously increase the amount of real wealth in the world, just as the effect of the First Industrial Revolution was. The children of tomorrow's displaced workers could—if we work things right—be employed at jobs that are more human, more creative, more personal (and require shorter

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hours) than anything their parents dreamed of. Just as we no longer have slaves to do our toting and hauling, we'll no longer need to have huge numbers of people working at repetitive, boring, brain-shriveling jobs.

A new economic setup will result when the full impact of the Second Industrial Revolution hits. And a new social order will arise too, just as it arose out of the First Industrial Revolution. Thus, a revolution in the research laboratories of the mid-Nineteenth Century is spreading through industry today, and will affect social and political revolutions around the world by the early Twenty-first Century.

There will be—there are now!—a new breed of Luddites who'll fight the Second Industrial Revolution as hard, and as unsuccessfully, as the original Ned Lud and his bully boys did. The disappointing fact is that a fair share of the new Luddites come from the science fiction community; they should know better.

There's even a Third Industrial Revolution that's just beginning, in which a large part of Earth's industrial plant will move off this planet. G. Harry Stine will have more to say on that subject in the near future.

Beyond that, however, there's a much more complex and far-reaching revolution shaping up. Its components come from such varied scientific disciplines as plasma physics, genetic biology, and behaviorist psychology. Its effects—well, it will affect everyone on Earth, and transform society completely. But for better or worse?

From the plasma physics labs, within the next ten years or perhaps sooner, will come news that a sustained thermonuclear fusion reaction has been achieved. By the end of this century, practical fusion power plants can be a reality.

The history of humankind, from Olduvai Gorge to sprawling megalopolises, can be viewed as a succession of finding and using constantly better energy sources. Muscle power, wood fires, coal, coke, petroleum, nuclear fission—all produced more energy, allowed man to expand his habitat, his ecological niche. Now we've reached out into space, down to the bottom of the sea, and covered the globe with our civilization. And we've fouled our planet with the waste products.

Fusion marks the turning point.

The fuel for fusion is deuterium, which comes from the sea. For every six thousand atoms of ordinary hydrogen in the oceans, there's an atom of deuterium. And the fusion process is energetic enough so that a cubic meter of sea water (about two hundred and twenty-five gallons) can yield four hundred thousand kilowatt-hours of energy. One cubic kilometer of sea water, then, has the same energy content as *all the known oil reserves in the world.* And that's using only one-sixth of the hydrogen in the water!

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This means that fusion power can be cheap and abundant. There will eventually be no need for fossil fuels or fissionables. Which in turn means there'll be no need to gut this planet for coal, oil, uranium. No oil wells. No black lung disease.

The energy from fusion can also be used to recycle anything. Fusion "torches" will be the garbage disposal system *par excellence.* With efficient recycling, the need for fresh raw materials goes down drastically. There goes the remainder of the mining industry. And trees can be used for making oxygen, not lumber.

Fusion energy will produce abundant electricity, without pollution, and with thousands of times less radioactivity involved than that of ordinary fission power plants. With that much electricity available, there need be no such thing as a "have-not nation." Seawater can be desalted and piped a thousand kilometers inland, if necessary. The energy will be cheap enough to do it. All forms of transportation—from automobiles to starships—can use clean fusion-based electricity.

But there's more coming.

Take genetic engineering, for example. The ability to tinker with the genes of unborn children. To correct genetic faults. To erase genetic diseases such as cancer and sickle cell anemia. Or, the ability to make certain members of the population stronger, smarter, longer-lived than the rest. To make others physically strong but mentally dull, so that they make good subjects for the "superior" rulers. Genetically-enforced dictatorship can be truly self-perpetuating. Forever.

Add to this the mental manipulations of the behaviorist psychologists. Using techniques such as "positive reinforcement," psychologists such as B. F. Skinner have come to the conclusion that there's no such thing as individual freedom. Entire populations can be controlled without the people ever realizing it.

Put together the power of fusion, genetic engineering, and behaviorist control, and you have a lovely world—or an unbreakable tyranny.

That's the revolution that's lurking at the end of the century, waiting for us. We can use these revolutionary forces to transform the world—in fact, they will transform the world. But in which direction? Toward greater individual freedom and responsibility? Or toward dictatorship?

These are problems that science fiction should and must examine. How can we handle such forces without falling into the trap of dictatorship? What new institutions and new social structures must be built to safeguard humankind?

For the *real* revolutionaries are those who know how to build, not just tear down. Whether they build for us all or just for themselves depends on many factors. But if "power to the people" is the motto, then it has to be the power of knowledge and understanding.

THE EDITOR

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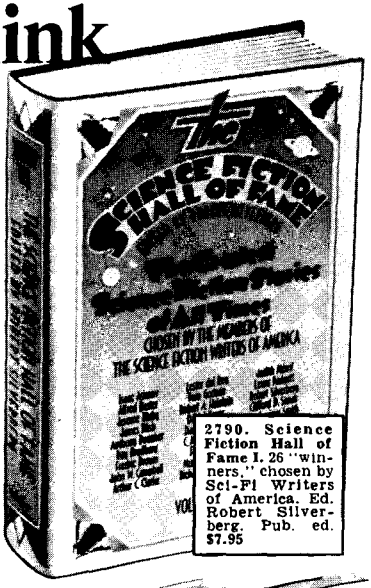

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